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REPORT RESUMES

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ASSISTANT GROUNDSKEEPER, TEACHERS COPY.
BY- FITTS, JAMES JOHNSON, JOHNNY
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THE PURPOSE OF THIS DOCUMENT IS TO PROVIDE A STUDY GUIDE FOR VOCATIONAL AGRICULTURE COOPERATIVE EDUCATION STUDENTS PREPARING TO BECOME ASSISTANT GROUNDSKEEPERS. IT WAS PREPARED BY VOCATIONAL AGRICULTURE TEACHERS IN CONSULTATION WITH SUBJECT MATTER SPECIALISTS. SECTIONS IN THE GUIDE INCLUDE (1) INTRODUCTION TO HORTICULTURE, (2) PLANT GROWING MEDIA, (3) PLANT GROWTH AND CLASSIFICATION, (4) PLANT PROPAGATION, (5) NURSERY PLANT PRODUCTION, (6) FLORAL CROP PRODUCTION, (7) LAWN ESTABLISHMENT AND CARE, (8) PLANT INSECT, DISEASE, AND PEST CONTROL, (9) EQUIPMENT OPERATION AND MAINTENANCE, AND (10) LANDSCAPE DEVELOPMENT AND MAINTENANCE. EACH SECTION INCLUDES INFORMATION SHEETS, ASSIGNMENT SHEETS, ASSIGNMENT ANSWER SHEETS, TOPIC TESTS, AND TOPIC TEST ANSWER SHEETS. A QUALIFIED VOCATIONAL AGRICULTURE TEACHER MAY USE THE MATERIAL AS A 180-HOUR COURSE OF STUDY WITH JUNIOR AND SENIOR BOYS WITH OCCUPATIONAL GOALS AS ASSISTANT GROUNDSKEEPERS. NECESSARY SUPPLEMENTARY MATERIALS ARE CITED IN THE DOCUMENT. THIS DOCUMENT IS AVAILABLE FOR $4.50 FROM AGRICULTURAL EDUCATION TEACHING MATERIALS CENTER, TEXAS AGRICULTURAL AND MECHANICAL UNIVERSITY, COLLEGE STATION, TEXAS 77843. (JM)

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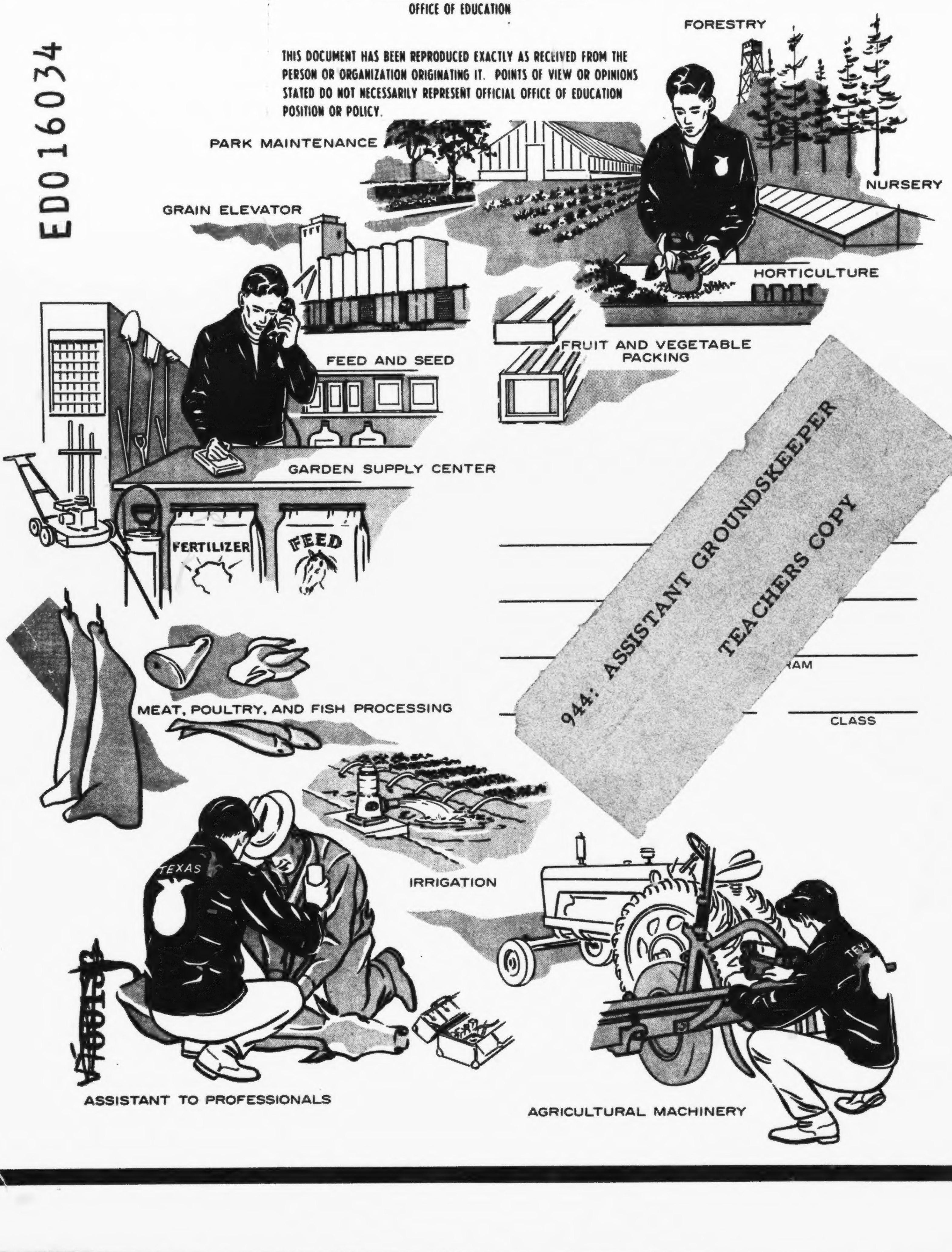
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MEMORANDUM

TO: The ERIC Clearinghouse on Vocational and Technical Education
The Ohio State University
980 Kinnear Road
Columbus, Ohio 43212

FROM: (Person) John Holcomb (Agency) Texas A&M University

(Address) College Station, Texas 77843

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RE: (Author, Title, Publisher, Date) "Assistant Groundskeeper," Teaching Materials Center, Texas A&M University

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This course of study is designed for the vocational agriculture student of Texas who is enrolled in a Cooperative Part-time Training Program in Agriculture.

Credit for the material contained herein is largely due to James Fitts, Vocational Agriculture Teacher, Victoria, Texas and Johnny Johnson, Vocational Agriculture Teacher, New Caney, Texas. These men were selected to assist in preparation of teaching materials for horticultural occupations because of their experience in the Cooperative Part-time Training Program in their respective departments in 1965-66 and their interest, training, and experience in greenhouse, nursery, and landscape work.

Because of their interest and dedication to vocational agriculture, they devoted four weeks at the Teaching Materials Center during the summer of 1966 in the preparation of teaching materials for horticultural occupations.

Acknowledgement is also given to Billy F. Irick, Subject Matter Specialist and Assistant Professor of Agricultural Education, who coordinated the development of this course of study and served as editor for this project.

John Holcomb, Coordinator
Teaching Materials Center

940-I-1

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Assignment Sheet
for
PROSPECTIVE EMPLOYEES IN HORTICULTURAL OCCUPATIONS

UNIT: Introduction to Horticulture

TOPIC: Horticulture as an Industry

OBJECTIVE: To become aware of the importance of Horticulture and to develop an understanding of the fields of study involved.

INTRODUCTION: Horticulture is an important branch of agriculture. The first definition of horticulture limited the field to cultivation of gardens. Flowers, vegetables, fruits, and ornamentals that were grown primarily in gardens soon acquired the name of "horticulture plants" in contrast to "field crops" such as corn and cotton. We now think of horticulture as the production of flowers, vegetables, fruits, and ornamentals in the garden on a large scale basis. It also includes the many services which are auxillary to the production and marketing of horticultural crops.

REFERENCES: Required:

1. Information sheet on "Horticulture as an Industry"

QUESTIONS or ACTIVITIES:

1. With what type of crop is the olericulturist conconcerned?
2. With what type of crop is the pomolgist concerned?
3. What four major types of crops are included in horticulture?
4. In which group of fruits do grapes belong?
5. In which group of fruits do apples belong?
6. What caused the expansion of vegetable growing?

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Information Sheet
on
HORTICULTURE AS AN INDUSTRY

There are three major fields of horticulture. Floriculture is the cultivation and management of ornamental and flowering plants. Landscaping has also become an important function of the floriculturist. Pomology is the science and practice of fruit growing. Olericulture is the production, processing and distribution of vegetable crops.

Floriculture was well developed thousands of years ago by the civilizations of Asia. Their beautiful gardens required much knowledge and skill. A landscape designer must have a knowledge of the principles of design along with a thorough understanding of plants. Plant breeding has become very popular in the floriculture field. Patience and care are needed in this tedious task of developing new and improved plants.

Pomology is a very demanding field. Fruit trees are under constant attack from diseases and insects. The fruit producer must be able to control these pests effectively. The pomologist also has to have a thorough understanding of plant growth. There is a great deal of specialization in the field of fruit growing. Many choose to work only with citrus, others concentrate on small fruits such as grapes, and still others deal with deciduous tree fruits such as apples. There are countless jobs to be found in the field of pomology.

Olericulture is a gigantic enterprise that is quite distinct from any other phase of plant production. The annual farm value of vegetable crops in the United States is well over a billion dollars. The big expansion in the vegetable industry was due primarily to an increase in production of out-of-season vegetables in the South and West. The production, processing, and marketing of this huge crop requires a great number of personnel.

As we can readily see, horticulture is a giant industry. If you are interested in plant growing and are willing to work hard in gaining new knowledge, a good future awaits you.

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Assignment Sheet
for
PROSPECTIVE EMPLOYEES IN HORTICULTURAL OCCUPATIONS

UNIT: Introduction to Horticulture

TOPIC: Exploring Occupational Opportunities

OBJECTIVE: To develop an understanding of the requirements of some specific occupations and to determine the factors to consider in selecting an occupation.

INTRODUCTION: This lesson is designed to help you decide upon an occupation in the field of horticulture. In this lesson we will explore only five major occupations, all of which are available to cooperative part-time students in agriculture. In addition, instructional materials have been prepared for these occupations to assist you in developing into a skilled worker with potential for advancement in your chosen occupation.

In recent years the need for trained workers in these occupations has increased greatly. If you like the work and apply yourself on the job and in your studies, a world of opportunity awaits you.

REFERENCES: Required:

1. Information Sheet, "Exploring Occupational Opportunities"

Supplemental:

2. "Handbook of Agricultural Occupations", Hoover

QUESTIONS or ACTIVITIES:

1. List the steps of advancement in a horticulture career.
2. If possible, what is the best way to answer self appraisel questions concerning a certain job?

UNIT: Introduction to Horticulture
TOPIC: Exploring Occupational Opportunities
(Assignment Sheet continued)

3. If you wanted a horticultural job which allowed you to work both inside and outside, which would you choose?

4. Prepare a list of businesses in your community which raise or sell horticultural products.

5. Study the 18 factors to consider in selecting a job and be prepared to apply these factors in selecting your occupation.

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Information Sheet
on
EXPLORING OCCUPATIONAL OPPORTUNITIES

The selection of a vocation in horticulture is similar to that of other fields. Basic questions arise in the mind of the person who is trying to select a vocation. These questions or factors must be dealt with before a satisfactory selection can be made. The following list points up some of these questions.

Factors One Should Consider in Selecting a Job.

1. What is the nature of the work? What kind of jobs will I be expected to do?
2. Does the occupation require chiefly mental or physical effort? Will my health allow me to do this work?
3. Is the work inside or outside work, or both?
4. What are the working conditions? With whom will I be working?
5. What personal qualifications are required for entry into the occupation?
6. What are the educational and training requirements for the job?
7. Is there opportunity for doing a variety of jobs?
8. Will the work require considerable travel and time away from home?
9. What financial earnings can one expect?
10. Are any fringe benefits provided by the business?
11. Is there a great deal of risk involved in performing the job?
12. What security and benefits are offered in the occupation?
13. Are there opportunities for advancement and self-betterment?

Exploring Occupational Opportunities
(Information Sheet continued)

14. Is the employment on a regular or seasonal basis?

15. Does one work regular hours? Eight, ten, or twelve hour day? Day or night shift?

16. Is there stability of residence or must one make frequent moves?

17. Will the job necessitate that one get along well with others or will one work pretty much alone?

18. How much personal expense is involved in clothing, transportation and meals?

Another very important question in the selection of a vocation is that of advancement. Usually a person who cannot advance in his chosen field will become unhappy and fail to do his best. This question should be investigated before choosing a vocation in the field of horticulture.

The opportunity for advancement is fairly good in this field. The following sketch demonstrates an example of the possible steps in the advancement of the horticulturist who applies himself to his work.

Advancement in Horticultural Occupations

1. Laborer
2. Foreman or Supervisor
3. Assistant Manager
4. Manager or Owner

As you can see from this example application, education and experience can determine the speed and degree of advancement.

Probably the most important question of all is, "am I personally suited for a career in horticulture?" It can only be answered after you have investigated the field and have a good knowledge of what it is and what it offers. The answer probably lies in self appraisal.

This self appraisal can be achieved by asking yourself the following questions:

1. Do I prefer working with things?

Exploring Occupational Opportunities
(Information Sheet continued)

2. Do I prefer working with facts, figures, and ideas?
3. Do I have a love for growing things?
4. Do I like to work with people?
5. What kind of work experiences have been most enjoyable to me?
6. What kind of work would I like to be doing five, ten, or fifteen years from now?
7. Will my health permit me to make the choice I want?

Probably the best way to determine the answer to these questions is by actually working on a job for a while. However, this cannot always be done. Circumstances do not always permit this.

There are other good ways to determine some answers. Your fondness for certain subjects in school, your interest in certain activities, study of the field of horticulture, talks with your teachers, guidance counselors and others may indicate interests and abilities that will help you to partially answer the questions. Such things as cooperativeness, willingness to work, dependability, willingness to assume responsibility, resourcefulness and self-reliance are all basic qualifications that you will need in ornamental horticulture as well as other occupations.

A close look at some of the jobs in horticulture will reveal many opportunities and requirements. As you look at each job try to decide if you are interested and qualified.

Job Title - Greenhouse Worker (941)

Job Description

A greenhouse worker grows plants in an artificially heated glass or plastic greenhouse. The plants grown may be vegetables or flowers, and the work may include the propagation of trees or ornamental shrubs from seeds or cuttings. Greenhouse specialties include producting out-of-season vegetables such as tomatoes, cucumbers, or leaf lettuce, producing cut flowers or pot plants, growing bedding plants for sale, or starting plants for outdoor nursery beds. In many cases a greenhouse is a part of a nursery operation. In such cases, a worker may be performing the duties of a nursery worker as well as those of a greenhouse worker. An employee in the greenhouse screens, mixes, sterilizes soil, and places it in growing containers. He sows seeds, starts cuttings, and transplants seedlings and plants. He waters, feeds, weeds, thins, prunes, and sprays growing plants. He may control the greenhouse temperature and humidity. He also maintains the greenhouse structure and equipment. He should know the names and the culture of the plants with which he works.

Job Title - Nursery Worker (942)

Job Description

A nursery worker grows seedlings and plants for landscaping, fruit farming, and forest replanting. He may work in one of several kinds of nurseries. Some nurseries specialize in producing fruit trees and small fruit transplants, some in ornamental trees and shrubs, and some in forest replanting materials. Some nurserymen operate greenhouses and produce their own seedlings and plants from cuttings. Some produce planting stock of two or more major lines of plants, trees, or shrubs.

A nursery worker prepares seedbeds, plants seedlings, weeds, cultivates, fertilizes, waters, prunes, and performs other cultural practices such as spraying and grafting. He digs, grades and packs plants for shipment. He may cut, lift, and lay sod. He transplants shrubs and trees, and in a tree nursery, gathers and processes forest tree seeds. He helps with the maintenance and repair of buildings and equipment.

A nursery employee assists customers in selecting plants for home landscaping. He also makes recommendations on maintenance to the customer and may work at a nursery where he will be required to make periodic checks on customer's lawns and to maintain the beauty of the landscape.

Job Title - Garden Center Employee (943)

Job Description

A garden center employee performs many jobs including caring for ornamental plants, moving plants and supplies into selling areas, arranging plants and supplies for display purposes, and selling the various products handled by the garden center. A garden center may be part of a large retail store, a part of a nursery or greenhouse operation, or a retail establishment separate from any other business.

Exploring Occupational Opportunities
(Information Sheet continued)

The work of a garden center worker includes cleaning, stocking, and arranging garden supplies on shelves, counters, and in windows. He cares for ornamental plants by watering, feeding, trimming, spraying, and controlling temperatures. The worker unloads and unpacks supplies as they arrive from wholesalers, loads orders on trucks, makes deliveries, and loads orders into customer's cars. He gives information to customers on care of plants, care of lawns, plant varieties, and merits of different garden supplies and equipment.

Job Title - Assistant Groundskeeper (944)

Job Description

An assistant groundskeeper cares for the area surrounding an industry or business, church, school, airport, apartment building, private estate, cemetery, or shopping center. The employee plants and cares for lawns and ornamental plants. The work involves mowing grass, reseeding, controlling weeds, and planting and spraying ornamental plants. He rakes and disposes of leaves and other refuse. Year round employment is provided through maintenance and repair of walks, drives, and equipment. The work may also involve making minor repairs to buildings.

Job Title - Parks and Landscape Employee (945)

Job Description

A parks and landscape employee performs the work necessary for proper maintenance of landscapes and park area.

The work of this occupation includes mowing grass, trimming, the edges of walks and driveways, planting, pruning and caring for trees, shrubs, hedges, lawns, and flower beds; controlling insects, diseases, and weeds; and caring for the soil. The work may also include such jobs as removing trash or snow, maintenance of swimming pools, care of boating facilities, general maintenance of buildings and equipment, and repair of roadways and drives.

Material for this information sheet was partially taken from Ornamental Horticulture for Vocational Agriculture in Alabama.

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944-II-1

Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Growing Media

TOPIC: Origin, Composition, and Importance of the Soil

OBJECTIVE: To develop an understanding of how soil is formed, what it is made up of, and its importance to horticultural plants.

INTRODUCTION: From ancient times man has strived to understand more about soil. No doubt the reason for this is that man's very existence depends upon the soil. Look around you Probably you will see that not many items in your room came from anywhere other than the soil. Even this sheet of paper you are now reading is a product of the forestry industry which depends on soil for tree growth.

Once we take time to learn how soil is formed, what it is made up of, and how it affects plants, we can do a better job of making it work for us.

REFERENCES: Required:

1. Information Sheet, "Origin, Composition, and Importance of the Soil."

Supplemental:

2. Our Land and It's Care, National Plant Food Institute, pp. 6-13.
3. Home Garden Leaflet No. LA 8, Department of Floriculture and Landscape Architecture, A&M University.
4. Crop Production in the South, Klingman, pp. 43-51.

UNIT: Plant Growing Media
TOPIC: Origin, Compsotion, and Importance of the Soil
(Assignment Sheet continued)

QUESTIONS or ACTIVITIES:

1. Name the three layers of soil.
2. What causes these three horizons to develop?
3. Which of the three layers is usually darker in color?
4. When does young soil begin to collect its plant nutrients?
5. What factors are responsible for the difference in soil colors?
6. What three components does a good soil provide to plants?
7. What are the three types of soil in regard to particle size?
8. Which is the largest of the three soil particles?
9. What governs the rate of soil development?
10. What is organic matter?

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Information Sheet
on
ORIGIN, COMPOSITION, AND IMPORTANCE OF SOIL

The climate, especially rainfall and temperature, indirectly controls the rate of soil development. The climate acts slowly, taking thousnads of years for the soil to reach a stage of balance with its environment.

A soil that has reached this degree of development usually has three distinct layers or horizons. As you dig downward in soil, you can notice differences in color, structure, and texture of the soil. This is especially noticeable along road cuts.

The topsoil is the first layer. It is usually richer and is of greater importance to plant growth. This layer contains most of the organic matter and is usually darker in color.

Next, we come to the subsoil. This layer does not contain as many nutrients as topsoil, but it is still important because of root development.

The third layer is the parent material and is generally less important to plant growth. It usually is below the area of heavy root growth and is seldom tilled.

These three layers are developed from weathering or wearing down of rocks. Wind, water, and ice break and crush the rocks. Eventually, a small plant begins to grow in this young soil. When the plant dies, it decays and gives the soil its first nutrients.

Other plants begin to grow and finally a rich soil is developed. Once the soil becomes productive, it provides three important components to a plant. These are fertilizer elements, air for the roots, and an adequate water supply.

You have noticed probably that there are several different soil colors. These are caused by different amounts of air being present as the soil is formed, the amount of organic matter, (decayed plant or animal matter), and the types of rocks from which the soil is formed.

You may have also noticed the different textures in soil. This is caused by the size of the soil particles. Sand is the largest and, therefore, is course to the touch. Silt and clay are the other two with clay being the smallest. It feels like flour when rubbed between the fingers.

UNIT: Plant Growing Media
TOPIC: Soil Moisture
(Information Sheet continued)

4. It is more critical to overwater plants growing in heavy soils during periods of prolonged cloudy weather than it is to overwater plants growing in light soils, during this type of weather condition. Soil type and the amount of sunlight affect plant-watering practices.

5. Loose, porous soils having a good structure soak up and hold more water than hard compact soils. This has an important influence on plant-watering practices.

6. Overwatering causes decreased aeration and subsequent root decay and death of the plant.

7. Underwatering causes wilting, dehydration, and subsequent death of the plant.

Material for this information sheet was taken from Ornamental Horticulture for Vocational Agriculture in Alabama, pp. 79-81.

In fine-textured soils, the particles are closer together and the attraction between soil and water is greater. Water may be expected to rise more slowly, but higher in soils of fine texture.

Under field conditions, moisture moves from wetter soil to drier soil. The difference is not always great, therefore, capillary water moves slowly and not far. Even so, even moisture moves a short distance to the roots of growing plants to make it an important plant-soil relationship.

Much soil moisture can be lost when capillary water moves to the surface and evaporates.

All living cells carry on respiration. Roots are made of living cells. In order for respiration to occur, oxygen must be present. Oxygen is normally formed in the air occupying the pore space of soils having good aeration. As water fills the pore space of these soils, however, the air is forced out (no two things can occupy the same space at the same time) and consequently, the supply of oxygen in the soil is lost. This means that root cells die and the root system decays away.

Some principles of understanding of soil-water relationships for the horticulture service worker.

1. Many soils cannot be worked when wet except at the expense of desirable soil structure. This is more true for heavy clay-like soils, and is less important for sandy soils. Structure is the arrangement of the soil particles.

2. Plants can be easily overwatered or underwatered. Sandy soils require more frequent waterings than heavy clay soils especially during periods of prolonged sunny days.

3. If soils do not have desirable moisture-holding capacities, they should be modified to make them more desirable.

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Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Growing Media

TOPIC: Soil Moisture

OBJECTIVE: To understand the importance of moisture to plants and how this moisture becomes available from the soil.

INTRODUCTION: Soil moisture can be a limiting factor in plant growth. No matter how many minerals the soil contains, it will not be productive unless it holds an adequate supply of water for optimum (best) plant development. It should be kept in mind that too much moisture can be as harmful as too little. By learning more about soil moisture, one can use his knowledge to change the environment of plants in small areas such as in the horticulture industry.

REFERENCES: Required:

1. Information sheet, "Soil Moisture"

Supplemental:

2. Soil, Yearbook of Agriculture, 1957, USDA pp. 49-60.

QUESTIONS or ACTIVITIES:

1. What part of the plant takes in water from the soil?
2. The process by which water leaves the plant in the form of vapor is called what?
3. What material helps soil hold water?
4. When is water holding capacity of vital importance?

UNIT: Plant Growing Media
TOPIC: Soil Moisture
(Assignment Sheet continued)

5. **What affects the speed at which capillary water can move through the soil?**

6. **Why does it harm soil to work it when it is wet?**

7. **What can be added to soil to make it hold more water?**

8. **Why will overwatering a plant kill the root system?**

9. **What happens to rainfall which falls to the earth's surface?**

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Information Sheet
on
SOIL MOISTURE

The moisture in the soil represents an important part of the plant environment. It is common knowledge that many plants tend to wilt when lacking in water. If water is not supplied to the plants soon after the wilting point is reached, they often die. Water is used by the plant in many ways. The needed water is taken from the soil by the roots. If plants are to remain healthy and grow well, water must be made constantly available to the plants. The type of soil in which the plants grow has a definite influence upon the frequency of watering.

Soil water is very important.

1. **Large amounts of water lost by plants in transpiration must be replaced. (Transpiration-loss of water in the form of vapor.)**
2. **Water acts as a solvent for dissolved minerals.**
3. **Water affects soil aeration. (Movement of air through the soil.)**
4. **Water affects soil temperature.**

What happens to rain which falls to the earth's surface?

1. **Runs off**
2. **Soaks in**
3. **Evaporates**

Water absorption is very important to the growth of plants.

Rain water is absorbed and rapidly passes downward through a porous soil When the upper surface of the subsoil has a slope, much of the water flowing over its surface seeps out of the hillsides in springs and quickly contributes to stream flow.

UNIT: Plant Growing Media
TOPIC: Soil Moisture
(Information Sheet continued)

Why do different soils have different capacities to hold or "soak up" water? When organic matter is used up, soil packs together. Thus a cloddy soil has fewer air spaces, its particles do not cling together in granules, and the lack of organic matter means that it weighs more than an equal volume of crumbly soil from a well managed plot.

A crumbly soil can take in water faster than a cloddy one, and it can hold more water. The thoroughly decomposed soil organic matter (humus) in a crumbly soil, can hold lots of water. Organic matter acts as a sponge in holding water. In addition, to the water held by the organic matter itself, is the water held in the pores between the soil particles and between the soil granules. Hundreds of very fine soil particles are glued together by the organic matter to form granules or crumbs.

The increased water-holding capacity of soils high in organic matter under natural conditions makes a big difference in the intake of water. This is extremely important during droughty seasons.

Moisture moves through the soil in all directions even against gravity by capillary movement. This movement is caused by the attraction water molecules have for each other as well as the attraction between water molecules and soil particles. Water molecules cling together and form droplets in the air or on a greasy surface where there is nothing to interfere. But when a drop of water falls on soil particles, it spreads out as a thin film over the soil particles, because the attraction between the soil particles and the water molecules themselves. Water that moves through the soil in this way is known as capillary water.

How far and how fast capillary water will move in a soil depends on the size of the soil particles and the condition of the soil. If the spaces around the soil particles are large, the attraction between the water molecules and the soil particles will not be enough to overcome the weight of the water and it will not rise too much. The movement that does take place however, will be rapid because there is little friction. This is true in sandy soils.

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Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Growing Media

TOPIC: Soil Mixtures

OBJECTIVE: To learn some of the most widely used soil mixtures and to become familiar with the methods used to produce soil mixes for growing horticultural plants.

INTRODUCTION: Not all plants grow best in the same type of soil mixture. Waterholding capacity, aeration, and drainage of the soil often determines a plant's value. By studying the different types of soil and how to increase their productivity, we can grow healthier and more profitable plants.

REFERENCES: Required:

1. Information Sheet, "Soil Mixtures".

Supplemental:

2. Plant Propagation, Hartman & Kester, Prentice Hall, N. J. , 1959, pp. 26-30.

QUESTIONS or ACTIVITIES:

1. What are the advantages of mixing organic matter and other soil "lightening" materials with loam soils?
2. Name the characteristics of an ideal soil mix.
3. Why is soil screened before mixing?
4. What equipment is required for large scale mixing operations?
5. What would be a good mixture for general container grown nursery stock?

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Information Sheet
on
SOIL MIXTURES

The Significance of Soil Mixtures:

1. Loam soils by themselves are generally unsatisfactory for growing plants for various reasons:
    a. Often "heavy"
    b. Often poorly aerated
    c. Often have a low moisture-holding capacity
    d. Often tend to become sticky after watering
    e. Often tend to shrink upon drying

2. Advantages of incorporating organic matter and soil "lightening" materials with loam soils include:
    a. Better aeration
    b. Greater ease of working
    c. Better drainage
    d. Better moisture-holding capacity

Some typical soil mixtures:

1. For potting rooted cuttings and young seedlings:

    1 or 2 parts sand
    1 part loam soil
    1 part peat moss (or leaf mold)

2. For general container grown nursery stocks:

    1 part sand
    2 parts loam soil
    1 part peat moss or leaf mold
    1/2 part dried or well-rotted manure

3. For plants which do best under acid soil conditions:

   2 parts sand
   2 parts loam soil
   2 parts peat moss
   1 part leaf mold
   1/2 dried or well-rotted manure

4. The University of California (U. C.) mix

   50 per cent sand
   50 per cent peat moss
   Fertilizer additives (a or b)

   a. If the mix is to be stored for an indefinite period before using. This furnishes a moderate supply of available nitrogen, but the plants will soon require supplemental feeding. To each cubic yard of the mix add:

      4 oz. potassium nitrate
      4 oz potassium sulfate
      2 1/2 lb. single superphosphate
      7 1/2 lb. Dolomite lime
      2 1/4 lb. calcium carbonate lime

   b. If the mix is to be planted within one week of preparation. This furnishes available nitrogen as well as moderate nitrogen reserve. For each cubic yard of the mix add:

      2 1/2 lb. horn and hoof or blood meal (13% nitrogen)
      4 oz. potassium nitrate
      4 oz. potassium sulfate
      2 1/2 lb. single superphosphate
      7 1/2 lb. dolomite lime
      2 1/2 lb. calcium carbonate lime

5. In making the U.C. mix for:

   a. Bedding plants and nursery container grown stocks use
      --75 per cent sand
      --25 per cent peat moss

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Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT:	Plant Growing Media
TOPIC:	Mulches
OBJECTIVE:	To learn more about the kinds of mulches and how they are used. Also, tc learn some common mulches and how to apply them.
INTRODUCTION:	There are many places in the landscape where mulches can and should be used. Rose and flower beds, trees and shrubbery, and newly seeded lawn areas are good examples of where mulches are needed.
REFERENCES:	Required: 1. Information Sheet, "Mulches." Supplemental: 2. Soil, 1957 Yearbook of Agriculture, U.S.D.A. pp. 151-156.
QUESTIONS or ACTIVITIES:	1. What are two basic kinds of mulches? 2. What is the disadvantage of asphalt paper mulch? 3. What fertilizer should be added to corncob mulch? 4. When should mulches be applied to established garden plants? 5. What is the most common mulch?

6. What can be used as a mulch in areas where organic material is scarce?
7. List the effects of mulches in the soil mix.
8. What is a mulch?
9. What is the disadvantage of straw mulch?

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Assistant Groundskeeper 944-II-4

Information Sheet
on
MULCHES

The landscape or greenhouse worker needs to know how to use mulching materials. What kinds of materials are used as mulches? Which kinds of materials make the best mulches? What are mulches used for? How deep should mulches be applied? When should mulches be applied? A mulch is any material applied to the surface of a soil primarily to conserve moisture, maintain a uniform temperature, and to help control weeds.

Effects of mulches in soil mix:

Dilutes the soil and usually increases root growth
Promotes soil granulation
Improves and stabilizes structure (surface mulch)
Affects soil pH slightly
Adds some fertilizer materials
Leads to nitrogen deficiency in cases where carbonaceous materials are added
Serves as food to micro-organisms
Introduces weed seeds in the soil in some cases

Two basic kinds of mulches

Inorganic or processed
Organic

Inorganic or processed mulch material

1. Aluminum Foil - Used to some extent in vegetable planting. Research work shows that growth of plants is increased markedly.

2. Asphalt - A light spray is used commonly by landscape contractors to hold soil in place on steep banks.

3. Ashpalt Paper - May be used but hard to keep in place. Can become unsightly.

UNIT: Plant Growing Media
TOPIC: Mulches
(Information Sheet contiued)

4. Crushed Stone - Gravel Chips - Pebbles - This is a common mulch in areas where organic mulch is scarce. Good in plantings for effect. May be colored to blend in with the features or the home, patio or landscape.

Black Polyethylene - Becoming a popular mulch especially in areas which are not part of the foundation planting. This mulch is used in commercial vegetable plantings.

Organic mulch material

1. Crushed Corncobs - Excellent mulch material. May be colored for use in landscape plantings. Usually quite inexpensive. Additional nitrogen should be applied.

2. Corncobs (whole) - Used to limited extent in farm gardens where the material is available. Can be used in utility gardens where appearance is not the main objective.

3. Lawn Clippings - This material is used to a limited extent. It should be applied loosely because it mats. Heat must be produced during decomposition.

4. Leafmold - Obtained from compositing fallen leaves in the fall of the year. This partially decomposes by the spring. Good mulch but hard to apply evenly and is not particularly neat looking.

5. Leaves - Used rather extensively in areas with many trees. The most inexpensive material available.

6. Peanut Hulls - Can be obtained in some garden centers or in areas where peanuts are processed. This is an excellent mulch and usually quite attractive.

7. Peat Moss - This is probably the most common mulch. It is quite rich looking when used correctly. The cost of this material is usually prohibited when large areas are mulched.

UNIT: Plant Growing Media
TOPIC: Mulch
(Information Sheet continued)

8. Sawdust - Very commonly used in areas where readily available. Nitrogen deficiency is almost certain if fertilizer is not applied regularly. Reports of toxic materials have not been substantiated by experiment stations.

9. Shredded Bark - In recent years, this material has become a popular item in garden stores. The material makes an excellent mulch and is very attractive in landscape plantings. Shredded bark lasts as long or somewhat longer than peat moss and adds valuable organic matter to the soil.

10. Straw - Used for winter protection and as a summer mulch. This material is highly inflammable so should not be used where a cigarette could be carelessly flipped into the material.

11. Wood Chips or Wood Shavings - In recent years this material has become available in large quantities. Wood chips decompose slowly and may be the cause of nitrogen deficiency if additional fertilizer is not applied.

When to Apply Mulch

The time to apply mulch to the garden on established plants is in mid-spring when the soil has warmed up sufficiently for active root growth. If it is applied before this time, the mulch will keep the ground too cool and root growth may be slow. If you are applying mulch to newly planted material, do so after the plants are put into place and watered-in well. If you are planting material in the late summer or early fall, apply the mulch immediately after watering so that the soil temperature will be kept warmer in the cool nights of autumn. It is important that there is sufficient root growth in fall planted stock so that the material does not heave due to freezing and thawing during the winter months.

How deep to Apply Mulch

For best results, the mulch should be at least 2 - 3" deep over the whole area during spring, summer and early fall. Tender plants which need

UNIT: Plant Growing Media
TOPIC: Mulch
(Information Sheet continued)

winter protection may require an additional 1-2" during the winter months around the crown or base of the plant. In the spring this additional material should be fanned out away from the stems or crowns of the plants before additional material is added for summer mulching.

Material for this information sheet was taken from Ornamental Horticulture for Vocational Agriculture in Alabama, pp. 84-86.

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Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Growing Media

TOPIC: Fertilizer Nutrients

OBJECTIVE: To learn about the fertilizer requirements of plants, the function of different minerals, and how to apply these minerals.

INTRODUCTION: Many of the materials used for mulching require an addition of fertilizer to reduce the chance of nitrogen deficiency or starvation of the growing plant material. Woodchips, sawdust, crushed corncobs and shredded bark need additions of nitrogenous fertilizers. A report from the U. S. D. A. suggests that 1/2 - 1 pound of ammonium nitrate or ammonium sulfate be added to each bushel of mulch material added to the plants. Remember, without the proper amounts of fertilizer, a lot of hard work can go to waste. Plants can not thrive with an improper balance of nutrients.

REFERENCES: Required:

1. Information Sheet, "Fertilizer Nutrients."

Supplemental:

1. Crop Production in the South, pp. 65-77.
2. Soils and How to Improve Them, Texas Agricultural Extension Service Bulletin B - 189.

QUESTIONS or ACTIVITIES:

1. What are the three primary elements?
2. What primary element gives the dark green color to plants?
3. What primary element is missing when leaves become mottled, spotted, streaked, and curled?

4. What are three sure ways of misusing fertilizer?
5. When is the best time to fertilize a lawn?
6. What are the three nutrients obtained mostly from air and water?
7. What are the two lime elements?

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Assistant Groundskeeper 944-II-5

Information Sheet
on
FERTILIZER NUTRIENTS

NUTRIENTS USED BY PLANTS

Large Amounts Needed		Rather Small Amounts Needed	
Nutrients Obtained Mostly From Air and Water	Nutrients Obtained From Soil	Nutrients Obtained From Soil	
Carbon	Nitrogen	Iron	Zinc
Hydrogen	Phosphorus	Manganese	Chlorine
Oxygen	Potassium	Boron	Molybdenum
	Calcium	Copper	
	Magnesium		
	Sulfur		
	Hydrogen		
	Oxygen		

SOME CONVENIENT NUTRIENT GROUPINGS

Grouping	Nutrients
Primary Elements	Nitrogen Phosphorus Potassium (Potash)
Secondary Elements	Calcium Magnesium Sulfur
Fertilizer Elements	Nitrogen Phosphorus Potassium (Potash)
Lime Elements	Calcium Magnesium
Trace Elements or Micronutrients	Iron Copper Zinc Boron Chlorine Manganese Molybdenum

Fertilizer Nutrients
(Information Sheet continued)

HOW PLANT NUTRIENTS AFFECT PLANTS

Nutrient and Chemical Symbol	Form in Which Available to Plants	Role in Plant Growth	Deficiency Symptoms
Nitrogen (N)	NH_4^+	Gives dark green color to plants	A sickly yellowish green color
	NO_2^-	Induces rapid growth Improves quality of leaf crops.	A distinctly slow and dwarfed growth
	NO_3^-	Increases protein content of food and feed crops. A constituent of all proteins. (Note: an over abundance of nitrogen leads to rank vegetative growth and tends to retard the date of plant maturity.)	Drying up or firing of leaves which starts at the bottom of the plants and proceed upward. The firing starts at top of the bottom leaves and proceed down the center along the mid-rib.
Phosphorus (P)	PO_4- HPO_4- H_2PO_4-	Stimulates easy root formation and growth. Gives a rapid and virorous start to plants. Hastens maturity. Stimulates blooming and aids in seed formation. Essential to the transformation of insoluble carbohydrates to soluble carbohydrates a constituent of all proteins.	Purplish leaves, stems, and branches. Slow growth and maturity.
Potassium (K)	$K+$	Imparts increased vigor and diseased resistance to plants. Increases plumpness of grain and seed. Essential to the formation and transfer of starches, sugars, and oils. Imparts winter hardiness.	Mottling, spotting, streaking or curling of leaves. Leaves are scorched or burned on the margins and tips. Firing starts at tip of leaf and proceeds down.

Fertilizer Nutrients
(Information Sheet continued)

HOW PLANT NUTRIENTS AFFECT PLANTS

Nutrient and Chemical Symbol	Form in Which Available to Plants	Role in Plant Growth	Deficiency Symptoms
Calcium (Ca)	Ca^{++}	Promotes early root formation and growth. Improves general plant vigor. Influences the intake of other plant nutrients.	Young leaves in terminal bud become hooked in appearance and then die at the tips and along the margins. Leaves have a wrinkled appearance. In cases the young leaves remain folded. There is a light green band along the margin of the leaves. Roots are short and much branched.
Magnesium (Mg)	Mg^{++}	A component of the chlorophyll molecule. Essential to the formation of fats, aids in the transport of phosphorous from older younger parts of the plant. Essential to fruit production. Influences uptake of other plant nutrients. Plays a role in the translocation of starch.	A general loss of green color which starts in the bottom leaves and later moves up the stalk. The veins of the leaf remain green. The plant stem is slender and weak with long branched roots. Leaves are mottled or chlorotic with dead spots. The leaf tips are turned or cupped upwards.

Fertilizer Nutrients
(Information Sheet continued)

HOW PLANT NUTRIENTS AFFECT PLANTS

Nutrient and Chemical Symbol	Form in Which Available to Plants	Role in Plant Growth	Deficiency Symptoms
Sulfur (S)	$SO_4=$ $SO_3=$	Essential to the formation of proteins. Essential to all division and fruit development. Promotes root growth. Stimulates seed production. Encourages more vigorous plant growth.	The young plant leaves are light green in color and have even lighter veins. The stalks are short and slender. Plant growth is slow and stunted. Fruit is immature and light green in color.
Boron (B)	$BO_3=$	A deficiency of this nutrient is associated with a decreased rate of water absorption and translocation of sugars in plants.	The young leaves of the terminal bud become light green at the base, with final breakdown here. In later growth the leaves become twisted and the stalk finally dries back to the terminal bud.
Iron (Fe)	Fe++ Fe+++	Essential to chlorophyll production acts as an electron carrier in enzyme systems which bring about oxidation reduction reactions in plants. Essential to the synthesis of proteins contained in chloroplasts.	The young leaves are chlorotic with the principal veins remaining green. The stalks are short and slender.

Fertilizer Nutrients
(Information Sheet continued)

HOW PLANT NUTRIENTS AFFECT PLANTS

Nutrient and Chemical Symbol	Form in Which Available to Plants	Role in Plant Growth	Deficiency Growth
Copper (Cu)	Cu^{+}	Involved in plant respiration and the utilization of iron. Acts as an electron carrier in enzyme systems.	The young leaves are permanently wilted without spotting or marked chlorosis. The twig or stalk just below tip and seedhead is often unable to stand erect in later stages when the shortage is acute.
Zinc (Zn)	Zn^{++}	Zinc is believed to be concerned in the formation of some growth hormones and in reproduction processes of certain plants. The element also functions in enzyme systems which are necessary for important reactions in plant metabolism.	Generalized leaf spots which rapidly enlarge involving areas between veins and eventually involving secondary and even primary veins. The leaves are thick and the stalks have shortened internodes.
Manganese (Mn)	Mn^{++}	This element functions in enzyme systems which are necessary for important reactions in plant metabolism. The element is also essential for certain nitrogen transformations in plants.	Spots of dead tissue are scattered over the leaf. The smallest veins tend to remain green producing a checkered effect.

Fertilizer Nutrients
(Information Sheet continued)

HOW PLANT NUTRIENTS AFFECT PLANTS

Nutrient and Chemical Symbol	Form in which Available to Plants	Role in Plant Growth	Deficiency Growth
Molybdenum (Mo)	Mo_4	Acts as an electron carrier in enzyme systems which bring about oxidation reduction reactions in plants. Oxidation reduction reactions are essential to plant development and reproduction and do not take place in the absence of micronutrients. The element is also essential to certain nitrogen transformations in plants.	

Fertilizer Nutrients
(Information Sheet continued)

If plant nutrient elements are to be available to plants, three basic conditions must be met.

1. The nutrient must be in a chemical form that the plant root can absorb.
2. The nutrient must be in a position where it can be absorbed by the plant root.
3. The nutrient must occur in the soil in proper proportions.

Soil fertility then, does not depend only upon the supply of nutrients in the soil, but upon the form in which the nutrients are found.

Some fertilizers harm seeds and foliage if the material is placed in direct contact with them. Inorganic fertilizers harm plant foliage more than organic fertilizers. Often organic fertilizers are called non-burning fertilizers.

   b. Applied in water solution with a sprinkling can (foliar application)

   c. Applied as a water solution around the base of the plant

2. Dry fertilizers

   a. Broadcast over the soil surface by means of a spreader

   b. Broadcase over the soil surface by hand (for small quantities). This is not the most accurate method for applying fertilizers, however.

   c. Deep drilling

   d. Side dressing

   e. Banding along the row

Material for this Information Sheet was taken from: Ornamental Horticulture for Vocational Agriculture, pp 86-92.

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Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Growing Media

TOPIC: Soil Organisms

OBJECTIVE: To learn some of the major soil organisms, their importance, and their effect on soils.

INTRODUCTION: Soils are composed of broken and weathered rocks, organic matter, water, and air. This material serves as a home for many kinds of plant and animal life. These plants and animals are both large and small in size. Some of these plants and animals are even so small that a microscope must be used to see them. Even though these organisms are small, they play a vital role in the health of our plants.

REFERENCES: Required:

1. Information Sheet, "Soil Organisms."

Supplemental:

2. Soil, 1957 Yearbook of Agriculture, U.S.D.A.

QUESTIONS or ACTIVITIES:

1. Name three small forms of plant life that are found in the soil.
2. How much of the soil consists of organisms?
3. What damage to plants can a nematode cause?
4. What harm to a plant may fungus cause?
5. In what way do bacteria help supply the plant with fertilizer nutrients?

UNIT: Plant Growing Media
TOPIC: Soil Organisms
(Assignment Sheet continued)

6. What are three ways to promote growth of beneficial soil organisms?

7. What are the three basic ways to control soil organisms which are harmful to seeds and plants?

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Information Sheet
on
SOIL ORGANISMS

Small plant life in the soil may be bacteria, fungi, or algae. The small animals in the soil include one-celled animals, and tiny, round worms called nematodes. The larger animals in the soil include worms, ants, snails, spiders, and insects. Some of these animals, especially the earthworms, help to make the soil better by burrowing through the soil, mixing it and making it possible for water and air to move easily through the soil. Also, some of the organisms in the soil are able to take nitrogen from the air and change it into a form that plant roots can absorb. Other organisms in the soil are not so helpful and actually do harm to plants by eating parts of the plant and causing various plant diseases.

Soil organisms make up about 1/1000 of the weight of an acre foot of soil. The living things in the soil use soil minerals for living activities. The minerals available to the plant then, are those that remain after the soil organisms have consumed a certain quantity for their life processes.

Soil Organisms
(Information Sheet continued)

THE SIGNIFICANCE OF SOIL ORGANISMS

Organism	Major Activity	Beneficial to Plant Growth	Harmful to Plant Growth
Earthworm	Mixes soil. Increases the availability of plant nutrients. (Especially nitrogen) Increases aeration. Promotes drainage.	X	
Nematode	Penetrates plant tissue, especially roots, and causes extensive damage.		X Only about 50 of the thousands of nematodes known are harmful to plants.
Algae	Aid bacteria and fungi in the decomposition of plant tissue, in making nutrients available to plants, and in the synthesis of humus.	X	
Fungi	Decompose organic residues. Promote the formation of humus. Cause many plant diseases.	X	X
Actinomycetes	Decompose organic matter releasing plant nutrients, especially nitrogen. Cause plant disease.	X	X
Bacteria	Decompose organic matter releasing plant nutrients; convert nitrogen from the air into a form available to plants (only certain bacteris are able to do this). Cause many plant diseases.	X	X

Soil Organisms
(Information Sheet continued)

The soil organisms which are beneficial to plant growth can be encouraged by adding organic matter, lime, and moisture to the soil.

The soil organisms harmful to plants need to be controlled. It has been estimated that the yearly loss in farm crops in the United States is five billion dollars. The cost of pesticides and required application of these expenditures is used to control harmful soil organisms.

Basically, there are three ways to control soil organisms which are harmful to seeds and plants:

1. Soil sterilization with steam
2. Soil fumigation or drenching with chemicals
3. Seed treatment

Material for this Information Sheet was taken from: Ornamental Horticulture for Vocational Agriculture, pp. 92-94.

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944-III-7

Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Growing Media

TOPIC: Soil Sterilization

OBJECTIVE: To learn the advantages and disadvantages of steam sterilization (pasteurizing) and chemical treatment.

INTRODUCTION: The soil organisms harmful to plants need to be controlled. It has been estimated that the yearly loss in farm crops in the United States if five billion dollars. The cost of pesticides and required application equipment amounts to almost $350 million a year. A considerable amount of these expenditures are used to control harmful soil organisms.

REFERENCES: Required:

1. Information Sheet, "Soil Sterilization"

Supplemental:

2. Soil, Yearbook of Agriculture 1957, U.S.D.A., pp. 157-164

QUESTIONS or ACTIVITIES:

1. Why are soils treated?
2. What are four sources of steam?
3. Why will soil that is too dry heat up slowly?
4. What is used to measure the soil temperature?
5. How can ammonia build-up in the soil affect plants?
6. What are the 7 factors to consider when fumigating soil?
7. What are 3 precautions to observe in using soil fumigants?
8. What is the cheapest method of sterilizing soil?

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Information Sheet
on
SOIL STERILIZATION

This control measure is highly effective and is widely used in the greenhouse for controlling the various soil-borne pests. Steam sterilization is also used to some extent in outdoor areas and for steaming bulk soils prior to use in growing plants.

Why are soils steamed?

1. **To kill soil- borne insects**
2. **To kill all of the bacteria, fungi, and virus organisms that are harmful to commercial crops.**
3. **To destroy weeds**
4. **To promote soil granulation**

Sources of steam:

1. **Existing steam boilers**
2. **Portable oil-fired steam boilers**
3. **Package steamers**
4. **Bricked in permanent-type boilers**

Preparing the soil for steaming:

1. **Add humus or organic matter.**
2. **Water the soil lightly. Soil that is too dry will heat up slowly because of poor heat conduction and distribution. Soil that is too wet will also heat up slowly because it requires considerable heat to heat a large quantity of water.**
3. **Keep the soil moist a week prior to steaming so as to encourage weed-seed germination. This will make the weeds easier to kill.**
4. **Rototill or otherwise loosen the soil. Be sure all soil is loosened and that all lumps are broken up.**
5. **If soil in raised benches is being sterilized, unroll the canvas steaming hose down the length of the bench. (Ground beds may have buried tile for steaming purposes.)**
6. **Cover the bench with a suitable cover. The cover may be draped over the bench, weighted down with pipe or held in place with "C" clamps.**

The soul should be steamed at 180° F. for thirty minutes.

KILLING TIME FOR VARIOUS SOIL ORGANISMS WHEN USING STEAM STERILIZATION

Organism	Time to Kill	Temperature
Nematodes	Instantly	140° F.
Soil Insects	Instantly	140° F.
Soil Fungi	10 minutes	140° - 160° F.
Soil Bacteria	10 minutes	140° - 160° F.
Weed Seeds	10 minutes	140° - 160° F.
Soil Virus	30 minutes	180° F.

The soil temperature during steaming is registered on a soil thermometer.

After steaming, it is often found that there are other problems which could develop.
1. Nitrifying and other beneficial soil organisms are killed.
2. Ammonia build-up in the soil which may cause root burn.

Solving after-steaming problems:
1. Use high quality, long lasting kinds of peat such as German or Canadian sphagnum, peats or other forms of organic matter that break down slowly.
2. Avoid sterilizing in hot water.
3. Don't feed the previous crop after it shows color, and leach it during the last waterings.
4. Keep soils cultivated during critical periods to encourage air to enter the lower soil.
5. Keep soil medium dry when steaming; sterilizing wet soils encourages the build-up of ammonia.
6. Adding 4 lbs. of gypsum or 40% superphosphate per 100 sq. ft. of soil immediately after steaming seems to help tie up free ammonia.
7. Leach heavily after steaming.

Soil Fumigation

Conditions under which chemicals are most extensively used for soil pasteurization:
1. Situations in which overhead costs are so low that the time required for aerati
is not expensive.
2. Situations where weeds and soil-borne insects are the main reasons for sterilizing.

Soil Sterilization
(Information Sheet continued)

3. Situations in which steam boilers are not available for sterilizing.

Chemical fumigants effective against fungi, bacteria, and nematodes are:
1. Chloropicrin (tear gas)
2. Methyl bromide
3. Mylone
4. Vapam or VPM
5. Vorlex
6. Trizone
7. Formaldehyde

Chemical fumigants effective against nematodes are:
1. Dichloropropene-dichloropropane mixtures
2. Ethylene di-bromide

Other fumigants include:
1. Bedrench
2. Zinophos
3. Trapex
4. Nemes
5. Brozone

Factors to consider in fumigating soil:
1. Soil temperature
2. Soil moisture
3. Soil texture
4. Organic matter content
5. Seals needed
6. Soil type
7. Depth of application

Forms in which chemical fumigants are applied:
1. Tractor-mounted equipment which lays a plastic film and injects the fumigant under the plastic cover.
2. Liquid water-miscible materials which are metered into sprinkler irrigation systems.
3. Granules, liquids, and powders which can be worked into the soil from equipment mounted in front of a rototiller.
4. Tractor-mounted chisel-tooth injection stands can be used.
5. Materials in pressure cylinders can be released under plastic covers.
6. Hand-operated needle point injection guns can be used.

No plants should be planted into a fumigant-treated soil for a period of two to three weeks.

Precautions to be observed in using soil fumigants:
1. Avoid inhaling the material.
2. Avoid contact of the fumigant with the skin.
3. Allow sufficient time for aeration after the material is applied.

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944-III-8

Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Growing Media

TOPIC: Plant Growing Media Other Than Soil

OBJECTIVE: To become familiar with growing media other than soil, to study their merits, and to learn how to use these media in growing horticultural plants.

INTRODUCTION: Every plant grower has his own opinion on which plant growing media is best. There are several very good additives and experience is the best method of selection.

REFERENCES: Required:

1. Information Sheet, "Plant Growing Media Other Than Soil"
2. "Horticulture Perlite for Texas Gardens", Bulletin TAP 256, Texas A&M Extension Service.

QUESTIONS or ACTIVITIES:

1. What is the most widely used media for reproduction of plants?
2. What type of peat is most widely used in the U.S.?
3. How much water will sphagnum moss absorb?
4. What happens to vermiculite when heated?
5. What leaves, when in a molded state, make the best growing media?
6. What 3 media are probably the most readily available for use by the horticulturist in the South?
7. Why have many people witnessed failures in plant growth in a medium of sawdust?
8. What are the advantages of perlite?

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Information Sheet
on
PLANT GROWING MEDIA OTHER THAN SOIL

Many different growing media may be used for rooting cuttings taken from desired plants. These may be used alone or in mixtures with soil.

SAND

Sand is probably one of the most widely used growing media in the reproduction of plants. It consists of small grain or rocks ground into a fine texture by weathering. This sand must be of a good quality and must not contain silt. The recommended sand for use in rooting cuttings is of the quartz type and should be washed. It can be the same quality sand used in masonary.

PEAT

Peat, commonly referred to as peat moss, is a material that has resulted from the decaying of the remains of thick vegetation in wet, marsh, swamp areas. It has been preserved over the years by being under water in a partially decomposed state. Peat varies widely in its state of decomposition, acidity, mineral content and origin. Light brown peat has been normally produced by a type of vegetation that results in a white acid state. Brown to black peat is of the type that is alkaline. This is the type that is desirable and most used in the United States. It has a very high water-holding capacity and contains approximately 1% nitrogen. This nitrogen assists in the decomposition process which results after peat has been placed in use. When peat is used, it should be broken apart and moistened well before adding to the growing media or mixture.

SPHAGNUM MOSS

Commercial sphagnum moss is a material that has been produced by dehydrating certain acid-bog plants. The dehydrating results in a relatively sterile material. It is very light in weight and has a very high water-holding capacity. It has been said that it will absorb 10 to 20 times its weight in water. After dehydrating the plant materials have been shredded in order to make it more usable. This material contains such small amounts of minerals that plant growth in it for any length of time will need additional fertilizer.

Plant Growing Media Other Than Soil
(Information Sheet continued)

VERMICULITE

This is a material that is micaceous in nature and is therefore a mineral. It is composed of thin layers that expand or explode when heated. It is heated in order to dehydrate it for use in horticultural mixutures. It is light in weight and has a very high water-holding capacity. Expanded vermiculite should not be pressed or compacted in any way when wet. If this is done, the desired porous structure of the material will be destroyed.

LEAF MOLD

Certain leaves can be decayed and placed into a growing media or mixture and will serve a very good purpose. Maple, oak, sycamore, and elm are among the most suitable leaves for this purpose. In preparing such a compost the layers of leaves should be alternated with thin layers of soil. Small amounts of nitrogenous fertilizer should be used between the layers of leaves and soil. This nitrogen assists in the decomposition of the leaves. The mixture should be protected from the weather so that leaching of the mineral elements will not result during heavy rain storms. To prepare suitable leaf mold, 12 to 18 months should be allowed for proper decaying of the leaves. A disadvantage of leaf mold is that it may contain nematodes, weed seed of noxious insects and diseases. It should be sterilized before being used as a growing media for horticultural plants.

SHREDDED BARK, SAWDUST, AND WOOD SHAVINGS

In the South these materials are probably the most readily available for use by the horticulturist. They are by-products of the lumber industry and can be obtained readily at very low cost. They are usually of the hardwood or pine variety. Decomposition of these materials is slow and one should be sure that they are decomposed before using them for plant propagation. Usually it is advisable to add nitrogenous fertilizer to these materials during the decaying process.

USING SAWDUST

Sawdust may be used to improve the physical conditions of soils and as a mulch. As a mulch it insulates the soil against wide fluctuations in temperature, discourages weed growth and reduces evaporation of soil moisture. However, there is a difference of opinion as to its merit. Some operators have long used this easy-to-get forest by-product in large quantity with complete success. Others have had unfortunate experience with sawdust and have discarded it as unsuitable to their needs.

Plant Growing Media Other Than Soil
(Information Sheet continued)

Possibly a lack of understanding as to how to handle sawdust has caused some of these failures. When sawdust is incorporated with the soil--used in place of peat--it requires large quantities of nitrogenous fertilizer if the plants growing in the soil are not to suffer from nitrogen starvation. The organisms in the soil which break down cellulose require appreciable amounts of nitrogen and will use up all available supplies of this element.

It has been estimated that 24 pounds of nitrogen are required per ton of sawdust from some species of pine to bring the nitrogen content up to 1.2 to 1.5 percent, the values needed for decomposition without inducing nitrogen deficiency in plants. This would equal 115 pounds of ammonium sulphate or 72 pounds of ammonium nitrate per ton of sawdust during the period of its decomposition, which may be two or three years. A 4-inch layer of loose dry sawdust over a space 20 X 30 feet weighs a little over a ton. A bushel of sawdust (10 to 15 pounds) requires 0.8 pound of ammonium sulphate or 0.5 pound of ammonium nitrate. When the sawdust is used as a mulch, nitrate fertilization is not required to the extent that it is when the material is incorporated with the soil.

Sawdust is widely employed as a plunging material in heel beds in retail sales yards, for which it has unanimous approval, despite the fact that research showed that it is very poor for this use, vastly inferior to peat. The need for frequent watering is the chief disadvantage of sawdust as a filler for nursery heel beds. Because of the rapidity with which it dries, it is necessary to soak thoroughly and often.

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Material for this Information Sheet was taken from Ornamental Horticulture For Vocational Agriculture In Alabama, pp. 98-100.

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944-III-1

Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Growth and Classification

TOPIC: Introduction

OBJECTIVE: To develop an understanding of the importance of studying the properties and life phenomenon exhibited by a plant.

INTRODUCTION: There are over 350,000 different kinds of plants in the world. No one person can know all of them, but he can learn the characteristics that are common to all of them. Without a knowledge of botany a plant grower is lost. If he does not know how plants grow, how can he possibly be successful in raising them?

REFERENCES: Required:

Crop Production in the South, Klingman, pp. 13-19.

QUESTIONS or ACTIVITIES:

1. What is botany?
2. How many different kinds of plants are known to exist?
3. Name two carbohydrates.
4. What is the major difference between plants and animals other than the ability to move and to think?
5. What was the wrong conclusion that Van Helmont made after his experiment concerning plant growth?

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Assignment Sheet
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UNIT: Plant Growth and Classification

TOPIC: Photosynthesis

OBJECTIVE: To learn how plants produce their food.

INTRODUCTION: Van Helmont failed in his experiment to determine why plants grow. He thought that water alone was responsible for the growth. Van Helmont did not know about photosynthesis; so his conclusion was wrong.

REFERENCES: Required:

Crop Production in the South, Klingman, pp. 19-24.

QUESTIONS or ACTIVITIES:

1. What does photo mean?
2. Define synthesis.
3. What is a more complete definition of photosynthesis?
4. What is a calorie?
5. What is a molecule?
6. What is the term used to describe the movement of gas or liquid from an area of high concentration to an area of low concentration?

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Assignment Sheet
for
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UNIT: Plant Growth and Classification

TOPIC: Respiration

OBJECTIVE: To learn about the process of respiration and to study its relation to photosynthesis.

INTRODUCTION: All cells must carry on respiration in order to stay alive. Most of us understand less about the process of respiration in the plant as compared to our knowledge or respiration in the animal. Yet the processes are very similar in the animal and plant cell.

REFERENCES: Required:

Crop Production in the South, Klingman, pp. 29-32.

QUESTIONS or ACTIVITIES:

1. Define respiration.
2. What two materials are formed when food is decomposed with the addition of oxygen?
3. How much do the chemical equation for photosynthesis and respiration differ?
4. What gas do plant release at night?
5. What are the raw materials needed for respiration?

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944-III-4

Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Growth and Classification

TOPIC: Water Absorption and Loss--Nutrient Absorption--Movement of Water and Nutrients in the Plant.

OBJECTIVE: To understand how water and nutrients are absorbed by the plant, to understand how water is lost, and to study the transportation system of the plant.

INTRODUCTION: One of the necessary functions of plants is to absorb water and nutrients from the soil. For proper management, one must understand these absorption processes and also the transporting of these materials by the plant.

REFERENCES: Required:

Crop Production in the South, Klingman, pp. 32-35.

QUESTIONS or ACTIVITIES:

1. What will happen to a plant if its inside pressure is greatly reduced?
2. What is the term used to describe cells that are filled tight and result in plants standing straight?
3. Explain how an over supply of fertilizer around a plant's roots affect its water absorption process.
4. What is transpiration?
5. What are nutrients?
6. What two conductive tissues make-up a vascular bundle?
7. Explain why girdling a tree causes it to die.

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Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Growth and Classification

TOPIC: Plant Food

OBJECTIVE: To learn the different plant foods and their functions.

INTRODUCTION: A food is any substance which can be used as a source of energy for carrying on the life processes. To really understand plant growth, one must understand the basis for life--food.

REFERENCES: Required:

Crop Production in the South, Klingman, pp. 24-29.

QUESTIONS or ACTIVITIES:

1. What is food?
2. What are the three foods used for energy and growth?
3. What elements make up carbohydrates?
4. What is the primary function of fats?
5. Where in the plant are fats most commonly found?
6. What is the process called by which hydrogen is added to oils?
7. What are the components of protein?
8. What four elements make up around 97% of the dry weight of most plants?

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Assignment Sheet
for
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UNIT: Plant Growth and Classification

TOPIC: The Plant Kingdom

OBJECTIVE: To become familiar with the system used to classify plant.

INTRODUCTION: People in West Texas may call a certain plant "dove weed" while an East Texas farmer may call it "croton". Names vary with localities. The only way to solve this problem was to develop a unified method of classification.

REFERENCES: Required:

Crop Production in the South, Kingman, pp. 35-40

QUESTIONS or ACTIVITIES:

1. What is taxonomy?
2. What are the four divisions of plants?
3. In which division do we find most of the disease causing plants?
4. What are some examples of beneficial bacteria?
5. What plants cause smut, rust, mildew, and scab?

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Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Propagation

TOPIC: Introduction to propagation

OBJECTIVE: To develop an understanding of the basic types of reproduction in plants and to learn the facilities, media, soil mixtures, and containers used in plant propagation.

INTRODUCTION: Plant propagation is the controlled reproduction of plants in order that man can have selected plants which are of specific value to him. Today with the many new advances in science the propagation of plants has become one of the most fascinating aspects of ornamental horticulture.

REFERENCES: Required:

1. Information Sheet on "Introduction to Propagation".

Supplemental:

2. Handbook on Propagation, #24, Brooklyn, Botanic Garden.
3. "Plant Production" B-178, Florida.
4. Plant Propagation Principles and Practices, Hartmann and Kester.
5. "Controlling Environment with Plastic Structures for Plant Propagation," TAP 387, Texas Agriculture Extension Service.

QUESTIONS or ACTIVITIES:

1. What is meant by plant propagation?
2. Give two methods by which plants may be propagated.

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UNIT: Plant Propagation
TOPIC: Introduction to Propagation
(Assignment Sheet continued)

3. Give three structures used for the reproduction of plants.

4. List three requirements of the ideal plant propagation structure.

5. Give three requirements of a good media or mixture used in propagation.

6. List five of the most common types of media.

7. What is used for chemical sterilization of soil?

8. Give three types of containers used in the propagation of plants.

9. What is the purpose of plant hormones?

10. What is a flat?

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Information Sheet
on
INTRODUCTION TO PROPAGATION

Plant propagation is the controlled reproduction of plants in order that man can have selected plants which are of specific value to him.

Plants may be propagated by two methods - sexual or asexual.

Seed reproduction in plants is basically a sexual process because it involves the union of sperm and egg cell before the seeds are formed. The seed has a supply of food sufficient for establishing a plant in a new location.

The vegetative methods of propagation such as layering, division, cutting, grafting, and budding are the asexual types of plant propagation.

There are a number of types of facilities and propagating structures for the reproduction of plants.

Many styles of greenhouses are used; they are usually made of glass, plastic, or similar material.

The hotbed is used for propagating, but it is generally smaller and less expensive. Heat is provided by fermenting manure or electric heating cables.

Many growers use a propagating case made of plastic to start young plants. This case may have mist spray in it to control the environment.

The ideal structure for plant propagation should have the proper amount of ventilation, temperature, and shade or light.

There are several media and mixtures used in propagation. All media should be loose and of a light mixture so that the excess water will drain. It should be free from seeds, nematodes, and disease organisms.

Some common types of media are sand, peat, sphagnum moss, vermiculite, and perlite.

If soil is used, sterilization is a must. It may be treated by steam or

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Introduction to Propagation
(Information Sheet continued)

chemicals. If chemicals are used, methyl bromide is an excellent chemical to use.

Flats are small rectangular containers used for germinating seeds or rooting cuttings. Many types of containers such as clay pots, peat pots, and plant bands are used.

Many plant propagators use a synthetic plant hormone to promote rooting of cuttings. Various methods are used in applying these root-inducing substances, but the most common is to dip the cutting in the hormone powder, which is a chemical mixed with powdered talc at suitable concentrations. Many of the rooting hormones contain a fungicide to give protection against diseases.

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Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Propagation

TOPIC: Propagation from Cuttings

OBJECTIVE: To develop an understanding of the methods of reproducing plants from cuttings.

INTRODUCTION: Cutting is one of the most important methods of propagating ornamental plants. Many plants can be started from cuttings in a limited amount of space. This is an inexpensive, rapid, and simple method of starting plants.

Cutting may be defined as the process of propagating plants by the use of vegetative parts, which when placed under suitable conditions, will develop into complete plants.

REFERENCES: Required:

1. Information Sheet on "Propagation from Cuttings".
2. Basic Gardening Illustrated, Sunset, pp. 17-19.

Supplemental:

3. Flower and Plant Production in the Greenhouse, Nelson, pp. 113-123.

QUESTIONS or ACTIVITIES:

1. List three reasons for producing plants from cuttings.
2. When are hardwood cuttings usually made?
3. List three plants which would be considered as herbaceous.
4. When are softwood cuttings made?

UNIT: Plant Propagation
TOPIC: Propagation from Cuttings
(Assignment Sheet continued)

5. What temperature is necessary to root cuttings?

6. What is the function of the callus growth on cuttings?

7. List three characteristics of a good cutting.

8. What are the requirements of a good rooting medium?

9. Give four types of rooting media.

10. When are cuttings ready to transplant?

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Information Sheet
on
PROPAGATION FROM CUTTINGS

Producing plants from cuttings is often cheaper and faster than producing them from seed, by budding or by grafting. The use of cuttings also helps maintain the characteristics of the original plant. Many types and varieties of plants will not produce the same quality or type of plant from seed and must be reproduced by cuttings, budding, or grafting.

Commercial plant producers use cuttings to secure large numbers of plants faster than securing the same plants from seeds. Cuttings are also used because they are easier and simpler to make than various budding or grafting operations.

Cuttings are classified and named according to the part of the plant from which they come; stem cuttings, leaf cuttings, or root cuttings.

Stem cuttings are most important and more commonly used. They are made by cutting a segment or piece of a growing limb or shoot from the parent plant. These cuttings are further classified or named by the type of wood or growth period from which the cuttings are made.

1. **Hardwood cuttings are usually made in the winter months (or dormant stage) from plants or trees which shed their leaves. Plants propagated by hardwood cuttings include Junipers and Yews.**

2. **Semi-hardwood cuttings are usually made from evergreen plants and are cut from newer growth on the plant after it has finished the rapid summer growth Plants propagated by semi-hardwood cuttings include euonymus, evergreen, azaleas, and holly.**

3. **Softwood cuttings are made from new growth in spring or early summer while that part of the plant is growing rapidly. Plants propagated by softwood cuttings include pyracantha, magnolia, and spirea.**

4. **Herbaceous cuttings are made from plant materials which are soft, rapidly growing, and relatively high in water content. Plants propagated by herbaceous cuttings include coleus, chrysanthemum, geranium, and carnation.**

Propagation From Cuttings
(Information Sheet continued)

The following environmental conditions are necessary for rooting cuttings; high humidity; air temperature of 60 degrees to 70 degrees at night and 75 degrees to 85 degrees during the day. The temperature of the rooting medium should be as close to 70 to 75 degrees as possible. Others are adequate light and a good rooting medium.

After cuttings have been made and placed under environmental conditions favorable for rooting, a callus layer may develop at the basal end of the cutting. The callus serves as a protective layer which retards the development of decay on cuttings that are fairly slow to root. The formation of callus and the formation of roots are independent of each other, although they often occur at the same time.

The plant from which cuttings are taken should be healthy and moderately vigorous. The cuttings should come from average growth from portions of the plant in full sun. The cuttings are usually three to five inches long with two or more nodes. The cuttings should be made with a sharp knife, making the basal cut at about a 45 degree angle just below a node. It is best to take cuttings in the early morning and keep them moist, cold and turgid (swollen) by wrapping in damp burlap or plastic bags until they are stuck in the propagating bed.

The lower 1/3 to 1/2 of the leaves should be removed from the cuttings. Dip the base of the cutting in a rooting hormone and insert in the rooting medium, spacing so that the leaves barely overlap. The depth of sticking the cuttings is generally 1/3 of their length. After the cuttings are stuck, the medium should be thoroughly watered to wash the particles closely around the base of the cuttings.

During rooting the medium must be kept uniformly moist, but never soggy. Until the cuttings begin to root, they should be kept under partial shade. After rooting, the shade should be removed for increasing periods of time until it is left off completely.

A good rooting medium is one which can be kept uniformly moist, but which also provides good drainage and aeration. Some satisfactory ones are: clean sharp sand (builders grade); vermiculite (horticultural grade), sand and peat moss mixture, equal parts of each; peat moss and perlite, equal parts of each.

The propagation box should be at least three to four inches deep. Usually they are wooden boxes or flats with slatted bottoms. Standard size nursery flats are usually about 15 inches wide by 22 inches long by 3 1/2 inches deep. This size is convenient to handle when filled with the rooting medium and cuttings.

Propagations from Cuttings
(Information Sheet continued)

To maintain the high humidity needed for rooting softwood cuttings, the top of the flat may be covered with plastic. This may be done by placing a wire or wooden frame over the flat to support the plastic 8 to 12 inches above the rooting medium. After the cuttings have been stuck and thoroughly watered, the flat is covered with a sheet of plastic. which should be tucked under the bottom of the flat or tacked to the sides and ends to hold it in place.

Cuttings should be properly managed after they have rooted. When the cuttings have roots 1/2 to 1 inch long, they are ready to transplant either into pots or directly to outdoor beds. If transplanted into pots, 2 1/4 to 3 inch pots are used. The potting mixture should contain about 1/3 organic matter such as peat or leaf mold, and 2/3 sandy loam soil. The cuttings should be partially shaded for 7 to 14 days after the cuttings are established. By fall the cuttings will be ready to plant in the field to grow to a size suitable for landscape use. If they were rooted late in the season, they should be carried over the first winter in a covered cold frame.

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Material for this Information Sheet was partially taken from:

1. State Department of Education, Agricultural Education Service, Montgomery, Alabama. "Ornamental Horticulture for Vocational Agriculture."

2. The Center for Research and Leadership Development in Vocational and Technical Education. The Ohio State University. "Propagating Horticultural Plants."

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Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT:	Plant Propagation
TOPIC:	Propagation by Layering
OBJECTIVE:	To develop an understanding of the different types of layering.
INTRODUCTION:	Many plants can be reproduced by layering. This is the development of roots on a stem while it is still attached to the parent plant. The rooted plant is then detached or cut after it has developed roots and becomes a new plant.

REFERENCES:

Required:

1. Information Sheet on "Propagation by Layering".

Supplemental:

2. "Propagation of Ornamental Plants", B-816-(1) Agriculture Extension Service.
3. Plant Propagation Principles and Practices, Hartmann and Kester.
4. "Plant Propagation", B-178, Florida.

QUESTIONS or ACTIVITIES:

1. Why do we wound plants that are to be layered?
2. What type of plants can be layered in a simple way?
3. What type of plants are air layered?
4. Why do we air layer plants?
5. What materials are used in air-layering plants?
6. When is the best time to air layer plants?

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Information Sheet
on
PROPAGATION BY LAYERING

The production of a new plant by layering is one of the surest methods. It is commonly used to propagate plants which are difficult to root.

A simple way of layering is performed by bending a branch of a plant to the ground and covering it with soil or a rooting medium, but leaving the terminal end exposed.

It is usually best to wound branches that are to be covered with soil. This helps to induce root formation. Many plants such as ivy, philodendrons, blackberries, and strawberries will root by this method.

Air layering is a method used to increase many plants such as croton, hibiscus dracaena, and rubber plants. Many tropical plants get "leggy" and shed their lower leaves; they cannot be sold as choice plants. This is a method of securing good plants at a minimum cost.

Air layering is an excellent way to produce plants which do not come true from seed. In some cases, a layered plant can be produced in a shorter time than by other methods of propagation.

One method of air layering is to select a spot just below the joint or node of the plant to be propagated. It may be necessary to remove a few leaves in order to do this. Make a slanting cut upward. Be careful not to cut all the way through. Take a toothpick or other small piece of wood and place it in the upper end of the slit to keep it from sealing. Then sprinkle the area which is to be propagated with a hormone. This will stimulate the root growth. Wrap a small handful of moist spagnum moss around this area to keep the roots moist while in formation. Cover the moss with a small piece of plastic film, polyethelyne, or kitchen-grade aluminum foil to seal in the moisture. Tie the plastic with two pieces of garden wire or plastic tie. In a few weeks, under ideal conditions, the roots should be in formation and the stem may be cut from the parent plant and placed in a pot.

Air layering is best practiced during the spring and summer months when high temperatures and high humidity contribute toward quicker rooting.

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Assignment Sheet
for
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UNIT: Plant Propagation

TOPIC: Propagation by Division

OBJECTIVE: To develop an understanding of how to increase plants by division.

INTRODUCTION: The propagation of plants by division is an easy and sure way of increasing plants such as chrysanthemums, daylilies, and some shrubs.

REFERENCES: Required:

1. Information sheet on "Propagation by Division".
2. Sunset Basic Gardening Illustrated, pp. 14-16.

Supplemental:

3. Propagation of Ornamental Plants, Texas Agr. Ext. Service, pp. 816.
4. Plant Propagation Principles and Practices, Hartmann and Kester, pp. 419.

QUESTIONS or ACTIVITIES:

1. List four plants that can be propagated by division.
2. When is the best time to divide shrubs?
3. Why do you divide perennials?
4. When should you divide perennials?
5. How should you divide perennials?

Information Sheet
on
PROPAGATION BY DIVISION

Division is a simple form of plant propagation. Some plants which can be propagated by division are daylilies, iris, chrysanthemums, geraniums, sanservieria, and shrubs such as primrose, jasmine and fig trees.

Most of these plants can be dug and shaken free of soil. Then the clumps can be divided into units or small plants, each having roots, stems, buds, and leaves. They can be planted in containers or as individual plants where they are to grow permanently.

Plants are best divided after their season of blossoming, but with care they may be so increased at any season of the year. Larger shrubs may be divided in the same method as smaller plants, but in most cases they will have to be separated with a shovel or hatchet. They should be divided when the shrubs are dormant for best results.

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Assignment Sheet
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UNIT: Plant Propagation

TOPIC: Propagation by Grafting and Budding

OBJECTIVE: To develop an understanding of the methods and types of grafting and budding.

INTRODUCTION: Budding and grafting is usually performed when certain plants cannot conveniently be reproduced by cutting, layering, or division. Also it is used when seeds do not reproduce the characteristics of the parent variety.

Experience is necessary to be successful at grafting and budding. One of the best ways is to study all you can about grafting and budding and then practice until you become skilled.

REFERENCES: Required:

1. Sunset Basic Gardening Illustrated, Lane Book Co., Menlo Park, Calif. pp. 20-25.

Supplemental:

2. "Propagation of Trees and Shrubs", Bulletin No. 1567, U.S.D.A.
3. " Topworking Pecan Trees by Inlay Grafting", Brison, T.A.P. - 93 - Texas Agriculture Experimenting Station.
4. Plant Propagation Principles and Practices, Hartmann, Hudson, and Kester, pp. 266-398.

UNIT: Plant Propagation
TOPIC: Propagation by Grafting and Budding
(Assignment Sheet continued)

QUESTIONS or ACTIVITIES:

1. Explain the meaning of stock and scion.
2. What is the cambium layer?
3. When do you graft deciduous trees and shrubs?
4. Why should you have a sharp knife in grafting?
5. List two kinds of budding.

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Assignment Sheet
for
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UNIT: Plant Propagation

TOPIC: Propagation from Seed

OBJECTIVE: To develop an understanding of producing plants from seeds.

INTRODUCTION: The production of plants from seed is commonly used by horticulturists. Many ornamental plants are produced by planting seeds in flats or other containers using the proper cultural methods.

Producing good plants from seed requires great skill and knowledge. The grower must be able to determine the requirements for many different plants. He must know when seeds should be planted, how much space should be allowed for each type of seed, how deep to plant them, and the proper cultural methods.

REFERENCES: Required:

1. Information Sheet on "Propagation From Seed".

Supplemental:

2. "Propagation of Ornamental Plants", B-816, Texas Agriculture Extension Service, pp. 2-3.
3. The Ball Red Book, pp. 3-12.
4. "Plant Propagation for Florida Homes", B-178, pp. 34-37.

QUESTIONS or ACTIVITIES:

1. Where does the average grower secure good seed?
2. What characteristics does a good growing media possess?

UNIT: Plant Propagation
TOPIC: Propagation from Seed
(Assignment Sheet continued)

3. What is the proper temperature to germinate seeds?

4. What will happen when a grower attempts to germinate seeds at a cool temperature?

5. What is the best temperature to grow plants?

6. Why do you use a sterile moisture holding material in planting seed?

7. What information should the label on a seeded flat contain?

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Information Sheet
on
PROPAGATION FROM SEEDS

There are several basic principles that the grower must observe if he is to get good germination of his seeds and thereby be successful in producing new plants. These are:

1. Use good seeds For the average grower good seeds can be obtained from the commercial producer of seeds. These are growers who are not growing plants for the purpose of getting a flower but for the purpose of collecting and processing the seeds for sale to plant propagators.

2. The grower must always use the best of growing media for germinating the seeds. A wide variety of materials can be obtained for this purpose. The media, whatever his choice, must possess certain characteristics. It must be finely screened, porous, loose and have a good waterholding capacity. It should be sterilized and in most cases low in the nutrients necessary for plant growth These nutrients can be added after germination and after the plant begins its growth.

3. The germinator or grower must maintain the proper temperature if the seeds are to germinate properly. Different plant seeds require different temperatures, however, there are general principles that will be helpful to the grower that will apply to most plants. Most of the common plants that the retail grower will deal with require a minimum of 65° for proper seed germination. In most cases the temperature should be about 70° F. This is very important because the grower who attempts to germinate seeds at a cool temperature will find that the seed will rot before having a chance to germinate.

4. The proper moisture level must be maintained and must be kept uniform. If this is not done after the seed germinates or sprouts, the plant will die.

5. After germination occurs most species of plants grow better in a slightly lower temperature and in a cooler house. The best temperature is usually between 50 to 60°.

To sum up these general principles, you could say that if you start with good seeds, sow them in a good growing medium keep them warm and moist until after germination, success is most likely to occur.

Reasons for failures in germination

If the seed is good and there are proper amounts of heat, moisture and air, nearly all the seed will germinate. However, some factors are responsible for seeds not germinating. The more important factors are:

1. Damaged seed - Seeds with broken seed coats, insect or rodent damage or heat damage will not germinate properly or else will fail to germinate at all.

2. Old seed - Seeds which are more than one year old will not germinate as well as fresh seed, especially if the old seed was not stored properly.

3. Soil or media too wet - Too much water keeps air (oxygen) from moving around the seed, causing it to rot before the plant can emerge.

4. Temperatures too cold - When soil and/or air temperatures are low, the emerging plant develops slowly and uses up the stored food before it can manufacture its own food. Cold temperatures also slow down the absorption of water needed to start the germination process.

5. Hard seed - Some plants produce seed with a tough coat which will not allow moisture to enter the seed. In such cases, it is necessary to use a special process to weaken the outer seed coat. This special process is called scarification, and is used to weaken the outer seed coat so that water may be absorbed to begin the process of germination.

6. Disease - Many diseases which affect plants are caused by bacteria or fungi carried to the young plant by air, water, or insects. These pests are present on the seed itself or are present in the soil. Damping off is one of the more common diseases affecting new plants. Many of these diseases can be controlled by using various seed treatments and through sterilization of the soil or media in which the seeds are planted.

7. Drying out of soil or media - It is necessary to keep the soil or media well watered after seeds are planted. Care must be taken to keep the soil or media moist enough so that the seed have a continuous supply of moisture, but not so much as to encourage damping off or reduced aeration of the media.

8. Planting too deep - Seeds which are placed too deep in the soil or media may fail to produce a plant. These seeds will use all of their stored food

Propagation from Seeds
(Information Sheet continued)

and energy before reaching the surface and die before they can begin to make their own food. A good rule to follow is to plant seed no deeper than three times the smallest thickness or size of the seed. Most small seeds should be planted from 1/8" to 1/4" deep with a covering of a loose moistured holding medium.

Seeding in flats

Starting plants by seeding thickly in flats is a common practice. The seed may be broadcast or planted along marked rows. The seed should be placed at a depth which allows for easy emergence of the seedling. If the seeds are broadcast, little covering is needed. Some propagators may use a layer of a sterile moisture holding material such as sphagnum moss as a seed bed to reduce the chances of damping off developing. However, care must be taken that the sphagnum moss is not soggy wet.

A flat 2" x 4" board made to fit inside the flat or a brick can be used for firming the top of the soil. In general, the smaller the seed, the less covering is needed. For example, celery seed would require less covering than either bean or corn.

Small seeds are often hard to handle and plant. To help distribute the smallest seed, you can mix them with a small amount of sand or other inert material.

After the seed are planted in the bed and covered, water the seedbed gently. To prevent washout of fine and small seeds, use fine misting nozzles, sub-surface irrigation or place burlap bagging over the seedbed and soak the bed thoroughly. When misting nozzles or sub-surface irrigation is used to moisten the seed and media, the usual practice is to cover the flat with a piece of glass or place the entire flat in a plastic bag to converse moisture until germination occurs. After the initial watering no additional watering is usually required prior to germination.

All seeded flats should be labeled. The label should include the following information.

1) Name of plant or variety
2) Date seeded
3) Student's name
4) Special treatment, if any

Propagation from Seeds
(Information Sheet continued)

Using pot labels

1) Always start entries at the blunt end of the label.
2) Allow the lower 1/3 of the label to remain free of entries for insertion into the soil of the flat (or pot). This will permit reading of the information on the label without lifting and wiping off the label.
3) The students should be taught that the seeding job is not complete until the label containing the required information pertaining to the seeding is in place in the container.

Material for this Information Sheet was taken from Ornamental Horticulture for Vocational Agriculture in Alabama, pages 54, and also from "Propagating Horticultural Plants, Module No. 3, Ohio State University.

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Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Nursery Plant Production

TOPIC: Developing a Nursery Vocabulary

OBJECTIVE: To expand the vocabulary to include the terms used in nursery plant production.

INTRODUCTION: Without words we would be lost. How could you talk to your employer about a particular problem if you did not speak the same language? Nursery plant producers, in a sense, have a language of their own.

The diseases, fertilizers, and techniques used in this business are often little known by outsiders. To be successful in your occupation, you must master this terminology.

REFERENCES: Required:

Flower and Plant Production in the Greenhouse, Nelson, pp. 313-325

QUESTIONS or ACTIVITIES: Define the following and study all of the words listed in the reference as they are all important.

1. Aerated
2. Alkaline
3. Bract
4. Budding
5. Callus
6. Cold Frame
7. Dormant
8. Floret
9. Hormone
10. Humidity
11. Internode
12. Lath House
13. Mylar
14. ppm

UNIT: Nursery Plant Production
TOPIC: Developing a Nursery Vocabulary
(Assignment Sheet continued)

15. PVC
16. Pistil
17. Propagation
18. Seedling
19. Sub-Irrigate
20. Vinyl

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Assignment Sheet
for
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UNIT: Nursery Plant Production

TOPIC: Planting Ornamental Trees

OBJECTIVE: To develop an understanding of the major factors involved in the proper planting of ornamental trees and shrubs.

INTRODUCTION: Since trees and shrubs are an important part of landscaping, it is essential to know how and when to plant them.

Proper cultural practices will provide the desired effects after your careful selection of plants. These practices include the care of the plants, preparing the soil, setting the plants, and providing proper care immediately after planting.

REFERENCES: Required:

1. Information Sheet on "Planting Ornamental Trees and Shrubs"
2. *Sunset Basic Gardening Illustrated,* pp. 31-32, 34-35

Supplemental:

3. *Approved Practices in Beautifying the Home Grounds,* Hoover, pp. 143-171

QUESTIONS or ACTIVITIES:

1. When should bareroot shrubs and trees be planted?
2. What size hole should be dug for the correct planting of shrubs and trees?
3. When planting a bareroot shrub or tree, how much of the top should be pruned?

UNIT: Nursery Plant Production
TOPIC: Planting Ornamental Trees and Shrubs
(Assignment Sheet continued)

4. What does the nursery term B&B mean?

5. What size tree usually needs guy wires?

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Information Sheet
on
PLANTING ORNAMENTAL TREES AND SHRUBS

Proper planting will benefit both the plants and you. If they are worth planting, they are certainly worth the time and trouble to do it correctly. Care and attention from the very beginning will be of value.

Container grown plants and those balled and burlapped (BB) can be planted anytime. Early fall is a good time to plant as they should be well established before summer.

Bareroot plants such as pecan and fruit trees, some shrubs, and roses need to be planted as soon as they begin to arrive at the nurseries. This is usually in late fall or early winter.

The size of the hole into which the plant is to be placed is very important. It should be at least one to two feet wider and at least six inches or a foot deeper than the roots of the plant.

The soil in the bottom of the hole should be worked well and mixed with organic matter. Unless barnyard manure is well rotted, avoid using it. Do not fertilize newly set-out plants, especially bareroot (BR) ones.

After the hole has been dug, you can fill it with water and allow it to soak into the surrounding soil. Place some of the soil mixed with organic matter into the bottom of the hole; set the plant on this. Fill in around the roots with more top soil and pack well.

You could water again and complete filling the hole with soil. The plant should be placed at the same level at which it was originally growing.

If the shrub was bareroot, you can prune about one-third of the top to compensate for the roots lost in digging. Generally balled and bagged will need some pruning also, but container grown do not.

If the plant was in a metal, paper, or plastic container, this should be removed before planting. If it was wrapped in burlap, this does not need to be removed. It can be loosened around the top near the base of the plant.

Planting Ornamental Trees and Shrubs
(Information Sheet continued)

Plants in containers may need to be watered before removing to prevent the soil from crumbling.

Newly planted trees or very tall shrubs will usually need to be staked especially if they are in a windy area. A stake can be placed on the side of the prevailing wind. This stake can be put in before planting if the plant is bareroot.

If the tree is over five inches in diameter, it may need guy wires. The wooden stakes would be placed some distance from the base of the tree and driven about 18" into the ground. Wires can be used from the tree to the stakes.

The wire should not be tied directly to the plant. Rubber hose protectors may be used around the wires. If the plant is not too large, plastic ties may be used.

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Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Nursery Plant Production

TOPIC: Pruning

OBJECTIVE: To develop an understanding of the modern methods of pruning ornamental shrubs and trees.

INTRODUCTION: Pruning of plants is the cutting off or cutting back of parts of a plant for better shape or more fruitful growth.

Trees and shrubs may need to be pruned in order to remove dead, diseased, or injured wood. Pruning may be needed to remove a branch that overlaps another, or to remove foliage right after plants are transplanted in order to make up for the loss of roots.

Pruning also helps to improve the shape of the plant, and makes it fit into the general pattern of the landscape.

REFERENCES: Required:

1. Information Sheet on "Pruning"
2. "Modern Pruning Methods" -B-997, Texas Agricultural Extension Service

QUESTIONS or ACTIVITIES:

1. What is the cardinal rule to follow in pruning ornamental plants?
2. Give 3 characteristics of pruning tools.
3. When can trees be pruned?
4. What two factors are important in pruning ornamental shrubs and small trees?

UNIT: Nursery Plant Production
TOPIC: Pruning
(Assignment Sheet continued)

5. How much top growth should be removed from bare-root dug plants?

6. Why do rose plants need to be pruned?

7. When should deciduous plants be pruned?

8. When is the proper time to prune shrubs which bloom in the spring?

9. When should climbing roses be pruned?

10. Why is a rounded or pointed top hedge perferred over a flat top hedge?

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Information Sheet
on
PRUNING

Take stock of your yard and check on an important chore--pruning. Are your sidewalks and driveways covered by overgrown, sprawling shrubs? Are your doorways crowded and your windows hidden? Then you should do some pruning.

Pruning, the removal of surplus or undesirable parts of the plant to improve the remaining parts, reduces the leaf surface or buds that grow into leafy shoots. This diverts the plant food from root production to shoot production and increases the leaf growth.

Deciduous plants, those which lose their leaves during cold weather, should be pruned between leaf drop and first spring growth. The skeleton is exposed and the plant is easier to work with. After pruning, the plant should have a framework of well-shaped uncrowded branches.

Many evergreen shrubs need annual pruning. These might include wax-leaf ligustrum, pittosporum, eleagnus, yaupon, and viburnum. They may be pruned into midsummer as they have no dormant period.

Sometimes coniferous evergreens such as arbor vitaes need to be pruned to keep them within a certain size. This can be done by shearing the main branches and end branches with sharp hedge shears. Gradually clip from the outside to almost where the brown foliage begins. This foliage will turn green when the light reaches it.

The average pruning is from about one-fifth to one-third of the entire shrub. Many shrubs should be pruned by thinning out rather than by severe pruning.

If a shrub is badly out of proportion to its surroundings, you can cut it back to within a foot of the ground. Fertilized, watered, and allowed to grow naturally, you will have an attractive shrub again.

Shrubs grown for formal hedges need frequent cutting to keep them closely sheared within definite dimensions. If a hedge is informal, it can be allowed to grow more or less at will; it can be controlled to some extent.

Pruning
(Information Sheet continued)

Shrubs which bloom in the spring should not be pruned until after their flowering. Severe pruning can be done then as the flowers are produced on wood grown the year before the blooms.

Pyracantha or other berry-bearing shrubs, should be pruned before the blooms appear in the spring. The berries for next fall and winter will be lessened by late or severe pruning.

Rose bushes produce flowers on wood formed the same season. Therefore, the more of last years' wood you prune, the better for your rose bushes. Cut back old, non-productive canes. Remove any dead or diseased wood.

Climbing roses should be pruned after flowering. Flowers this spring will be produced on canes grown last season; they will be much greener looking and not as old appearing as the canes produced the season before. Branches which are too long may be cut back about one-third of their total length.

Use the proper tools when pruning. Be certain they are clean and sharp. Make a clean, smooth cut and leave no jagged edges, bruised bark, or stubs.

Always remove any dead, diseased or broken branches from plants. If branches are rubbing, crowded, weak, or growing downward, they should be removed.

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944-VI-1

Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Floral Crop Production

TOPIC: Introduction to Floral Crop Production

OBJECTIVE: To develop an understanding of the field of floriculture and to learn about sources of information on the subject.

INTRODUCTION: Floral crop production in the United States in a comparatively young business which probably started during the early part of the nineteenth century in Pennsylvania. At that time, Philadelphia was considered the social center of the country. The need for floral arrangements for special occasions brought about the beginning of the production of floral crops.

Today the production of flowers is one of America's largest industries.

REFERENCES: Required:

Flower and Plant Production, Nelson, pp. 3-15.

QUESTIONS or ACTIVITIES:

1. Why is it necessary for flowers to be produced throughout the year?
2. What are the three most widely grown cut flowers?
3. Where do most retailers of pot plants acquire their plants?
4. What is the motto of the Society of American Florists?
5. What magazine on the floriculture industry is available to the southern producer and can be obtained from Ft. Worth, Texas?

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944-VI-2

Assignment Sheet
for
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UNIT: Floral Crop Production

TOPIC: Growing Annuals

OBJECTIVE: To develop an understanding of how to successfully grow annual plants.

INTRODUCTION: Annuals are temporary plants in that they grow for only one year. Beginners and professionals alike enjoy working with annuals.

REFERENCES: Required:

Basic Gardening Illustrated, Sunset, pp. 102-103

QUESTIONS or ACTIVITIES:

1. When do most annuals bloom?
2. Which small seeded annual is simplest to grow?
3. Give three examples of large seeded annuals which are easy for beginners to grow.
4. What is the general rule for watering annuals?
5. What should be done to most annuals after they are through blooming?
6. When do morning glories bloom?
7. Do hollyhocks produce blue flowers?
8. What color blooms are produced by the scarlet sage?
9. Where can the portulaca be used effectively?
10. What is one disadvantage of asters?

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Assignment Sheet
for
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UNIT: Floral Crop Production

TOPIC: Perennials

OBJECTIVE: To develop an understanding of how to successfully produce perennial flowering plants.

INTRODUCTION: Perennials are long-time favorites of gardeners everywhere. Unlike annuals, they continue to flower year after year. During the winter the plant goes into a period of rest called dormancy. The following season it begins growth and starts to bloom.

REFERENCES: Required:

Basic Gardening Illustrated, Sunset, pp. 100-101.

QUESTIONS or ACTIVITIES:

1. What is probably the best plants for a new gardener to grow?
2. What is one of the most common uses of the large mum?
3. How often should primrose clumps be divided?
4. How can one cause polyantha primroses to repeat bloom in the fall?
5. If peonies are properly planted, how often will they need dividing?

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944-VI-4

Assignment Sheet
for
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UNIT:	Floral Crop Production
TOPIC:	Bulbs
OBJECTIVE:	To develop an understanding of how to properly use bulbs in the floriculture industry.
INTRODUCTION:	A bulb is an underground bud that sends down roots and has a very short stem covered with leafy scales such as lilies and onions. It is both interesting and rewarding to plant a bulb and obtain a beautiful flowering plant.
REFERENCES:	Required: Basic Gardening Illustrated, Sunset pp. 104-107

QUESTIONS or ACTIVITIES:

1. When do tuberous begonias bloom?
2. Why should first foliage not be cut until it turns yellow?
3. What can be used to protect bulbs from soil insects and rot?
4. What is a true bulb?
5. What is a rhizome?
6. Study the terms on page 107.

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944-VII-1

Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Establishing and Caring for Lawns

TOPIC: Turf Grasses for Texas

OBJECTIVE: To develop an understanding of planning the lawn and the proper selection of turf grasses for Texas.

INTRODUCTION: A beautiful lawn is the foundation for a pleasant home landscape. No matter how expensive the home, how beautiful the trees, shrubs, and flowers, they will not show up to the best advantage with an unattractive lawn.

A lawn is a living thing consisting of thousands of tiny living plants or grasses. Each plant needs food, water, sunshine and soil. It is largely dependent upon you for many of these.

The lawn is a valuable part of the landscape design and should provide the proper setting for the house, trees, shrubs, and other buildings. It should be established properly in order to provide a beautiful area which will be easy to keep attractive.

REFERENCES: Required:

"Home Lawns", B-203, Texas Agriculture Extension Service, pp. 1-5.

QUESTIONS or ACTIVITIES:

1. Give five factors to consider in the selection of a turf grass.
2. List two ways turf grasses are classified.
3. Give three points about bermuda as a turf grass.
4. Give six points about St. Augustine grass as a turf grass.
5. **Why does Zoysia grass make an excellent turf?**

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Assignment Sheet
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UNIT: Establishing and Caring Lawns

TOPIC: Establishing a New Turf

OBJECTIVE: To develop an understanding of the principles in the establishment of a new turf.

INTRODUCTION: The lawn is a valuable part of the landscape design and should provide the proper setting for the house, trees, shrubs, and other buildings. It should be established properly inorder to provide a beautiful area which will be easy to keep attractive.

REFERENCES: Required:

1. "Home Lawns", B-203, Texas Agriculture Extension Service, pp. 5-7.

QUESTIONS or ACTIVITIES:

1. List three distinct steps necessary in the establishment of turf.
2. List five types of organic matter which can be added to a new turf.
3. How should fertilizer applications be determined?
4. What are the factors to consider in determining whether a yard will be seeded, sprigged, or sodded?
5. Why is the frequency of watering reduced as the lawn begins to take root and grow?

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Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Establishing and Caring for Lawns

TOPIC: Managing an Established Turf

OBJECTIVE: To develop an understanding of the principles and practices involved in managing an established turf.

INTRODUCTION: After the lawn has been properly established it is important to know the time and rate of fertilization, when to water, and to have a working knowledge of keeping a lawn beautiful.

REFERENCES: Required:

1. "Home Lawns", B-203, Texas Agricultural Extension Service, pp. 8-12.

QUESTIONS or ACTIVITIES:

1. List four major factors involved in maintaining turf.
2. Why is Nitrogen the key element in turf production?
3. Why is Phosphorous important to the lawn?
4. Explain what a lawn looks like when it has a nitrogen deficiency.
5. What does a plant look like when it has a phosphorous deficiency?
6. Describe an iron deficiency in the turf.
7. When should the turfed areas receive an application of Complete fertlilizer?
8. How may chlorsis be corrected?
9. Why are light, frequent sprinklings harmful?
10. Why is the aeration of the soil in a turf important?

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944-VII-4

Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Establishing and Caring for Lawns

TOPIC: Turf Problems

OBJECTIVE: To develop an understanding of the problems which occasionally arise in the management of a lawn.

INTRODUCTION: Many problems may arise in the successful management of beautiful well-kept lawns. The horticulturist should be able to identify the important lawn diseases and insects and have a working knowledge of the control of these problems.

REFERENCES: Required:

1. "Home Lawns", B-203, Texas Agriculture Extension Service, pp. 12-14.
2. "Texas Guide for Controlling Insects on Ornamental Plants", Texas Agricultural Extension Service, L-199.

Supplemental:

3. "Lawn Insects, How to Control Them", B-N0. 53, U. S. D. A.

QUESTIONS or ACTIVITIES:

1. List four problems which occasionally arise in the production of a turf.
2. What is the best way to control weeds ?
3. What chemical is commonly used to control broad-leaved annual weeds in the lawn?
4. Describe the appearance of a lawn which has Brownpatch ?

UNIT: Establishing and Caring for Lawns
TOPIC: Turf Problems
(Assignment Sheet continued)

5. What is a good fungicide for controlling Brownpatch?

6. List eight dusts or sprays which are effective for controlling most lawn insects.

7. Why is renovation of old lawns necessary?

8. List four dusts that are recommended for the control of chiggers.

9. Give three good sprays for the chinch bug.

10. Give the mixture for controlling the Bermuda grass mite.

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944-VIII-1

Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Controlling Plant Insects, Plant Diseases and Other Pests

TOPIC: Causes of Plant Diseases

OBJECTIVE: To learn what causes plant disease and to learn to recognize these diseases.

INTRODUCTION: There are probably about as many diseases as there are plants. Man must constantly strive to ward off these diseases. If all research stopped, it is possible that man would be living in a world of famine and hardship.

REFERENCES: Required:

1. "What You Should Know About Plant Diseases", Texas Agricultural Extension Bulletin--B--995.

Supplemental:

2. "Texas Guide for Controlling Insects and Diseases", Texas Agricultural Extension Bulletin--L--245, 1965.

QUESTIONS or ACTIVITIES:

1. What are the four most important causes of plant disease?
2. What is photosynthesis?
3. What is a vector?
4. What is the best approach to controlling canker disease?
5. What are fungi?

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944-VIII-2

Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Controlling Plant Insects, Plant Diseases and Other Pests

TOPIC: Identifying Plant Diseases

OBJECTIVE: To learn to identify plant diseases and to become familiar with the terminology used in connection with plant diseases.

INTRODUCTION: Better quality and higher yields at lower cost are possible with better disease control. Diseases cost producers millions of dollars each year. A large part of this expense can be prevented by learning more about diagnosing and checking plant disorders.

REFERENCES: Required:

1. "Identifying Plant Diseases", Texas Agricultural Extension Bulletin-MP-512

Supplemental:

2. "What You Should Know About Plant Diseases", Texas Agricultural Extension Bulletin-B-995.

QUESTIONS or ACTIVITIES:

1. What is the key to effective control of plant disease?
2. What is meant by blasting?
3. What is exudate?
4. What is the best way to check nematode damage?

Activity:

1. Study the terms that discribe plant diseases on page 7 of reference no. 1.
2. Collect all the publications on plant diseases from your county agent.

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Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Controlling Plant Insects, Plant Diseases, and Other Pests

TOPIC: Application and Safety Precautions of Horticultural Chemicals

OBJECTIVE: To learn the safe use of the important horticultural chemicals and procedures for effective application.

INTRODUCTION: There are numerous methods of applying pesticides, fungicides and other horticultural chemicals. The purpose is to completely cover the plant or pest with the proper amount of control material. The first factor to consider is the welfare of people using the material, second is the welfare of the plants, and then the effectiveness of the material in controlling the pest or diseases.

REFERENCES: Required:

1. Flower and Plant Production, Nelson, pp. 302-311.
2. Basic Gardening Illustrated, page 81.

QUESTIONS or ACTIVITIES:

1. What is the first factor to consider when using chemicals?
2. What is the second factor to consider?
3. What is the third factor?
4. What is one of the most common means of applying pest or disease control materials in the greenhouse?

UNIT: Controlling Plant Insects, Plant Diseases and Other Pests
TOPIC: Application and Safety Precautions of Horticultural Chemicals
(Assignment Sheet continued)

5. **How should you store a water hose to prevent spreading of diseases?**

6. **What are the safety rules that should be followed when a person is working with pest control chemicals?**

7. **Why should a plant be completely covered with contact poisons?**

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Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Controlling Plant Insects, Plant Diseases and Other Pests

TOPIC: Controlling Leaf Diseases

OBJECTIVE: To learn how to identify and control the major leaf diseases.

INTRODUCTION: A customer who wishes to buy a plant is usually looking for one which has a lot of healthy leaves. A plant will not sale if its leaves have wilted and turned brown. This will result in decreased profits on the part of the producer.

REFERENCES: Required:

1. "Texas Guide for Controlling Diseases on Ornamental Plants" Texas Agricultural Extension Bulletin-MP-574, pp 10-13

Supplemental:

2. "What You Should Know About Plant Diseases", Texas Agricultural Extension Bulletin-B-995.

QUESTIONS or ACTIVITIES:

1. How does one treat leaf scorch or scald?
2. What causes sooty mold?
3. What causes oedema?
4. What two chemicals are good for treating mosaic or leaf curl?
5. When do you spray azaleas and camellias for galls?
6. How often would one spray to control bacterial leaf spots?
7. What usually causes chlorosis?
8. What type of disease is anthracnose?

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Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Controlling Plant Insects, Plant Diseases, and Other Pests

TOPIC: Controlling Stem, Branch, and Trunk Diseases

OBJECTIVE: To learn the major diseases that affect stems, branches, and trunks of horticultural plants and how to control these disorders.

INTRODUCTION: The stems, branches, and trunks of plants are necessary for plant growth. They are the transportation system for the plant since water and food move through them. A disease affecting these systems can cause a definite decrease in plant vigor.

REFERENCES: Required:

1. "Diseases on Oranamental Plants", Texas Agricultural Extension Bulletin - MP - 574, pp. 14-16.

Supplemental:

2. "What You Should Know About Plant Diseases", Texas Agricultural Extension Bulletin - B - 995.

QUESTIONS or ACTIVITIES:

1. How does a person treat a plant that has gall?
2. What is the control for a dodder infestation?
3. How does moss damage a plant?
4. What part of a plant does green scurf attack?
5. What causes wood rot?
6. What is the treatment for slime flux.
7. How is mistletoe spread?
8. What causes lichens?

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Assignment Sheet
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UNIT:	Controlling Plant Insects, Plant Diseases, and Other Pests
TOPIC:	Controlling Root Diseases
OBJECTIVE:	To learn to detect root diseases and how to control them.
INTRODUCTION:	Roots are the storage organs of plants. If a disease is present in the roots of a plant, growth and vigor will be greatly affected.
REFERENCES:	Required: 1. "Diseases on Ornamental Plants", Texas Agricultural Extension Bulletin - MP - 574, pp. 17-21.

QUESTIONS or ACTIVITIES:

1. What is a good treatment for mushroom root rot?
2. What is a good treatment for crown gall and hairy rot?
3. What is the first step when planning to fumigate for mushroom root rot?
4. What is the minimum distance from live plants is it permissible to use carbon bisulfide as a soil fumigate on mushroom root rot?
5. In what sections of Texas is southern blight most common?
6. What temperature is required for southern blight development?

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Assignment Sheet
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UNIT: Controlling Plant Insects, Plant Diseases and Other Pests

TOPIC: Controlling Diseases Affecting the Entire Plant

OBJECTIVE: To learn the causes, symptoms, and control of diseases affecting the entire plant.

INTRODUCTION: Many diseases are not localized in the stems, roots, or leaves; they damage the plant in all parts. There are various controls for these diseases, but one must first be able to make a proper diagnosis. Never assume that because a plant shows a symptom of a known disease that you have diagnosed the disease properly. Many diseases have some common symptoms. Don't make the mistake of diagnosing a plant disease without studying all symptoms of all diseases common to the particular plant.

REFERENCES: Required:

1. "Texas Guide for Controlling Diseases on Ornamental Plants" Texas Agricultural Extension Bulletin-MP-574, pp. 22-23

Supplemental:

2. Basic Gardening Illustrated, page 80.

QUESTIONS or ACTIVITIES:

1. What symptoms would a chrysanthemum exhibit that had aster yellows that would not be present if it was affected by verticillium wilt?
2. What is an effective control for aster yellows?
3. What is an effective control for verticillium wilt?

UNIT: **Controlling Plant Insects, Plant Diseases and Other Pests**

TOPIC: **Controlling Diseases Affecting the Entire Plant**

(Assignment Sheet Continued)

4. **In what section of Texas is Verticillium wilt most common?**

5. **Who are the only people that should handle chloropicrin?**

6. **What is a chemical called that controls mites?**

7. **What are two effective treatments for botrytis blight?**

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Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Controlling Plant Insects, Plant Diseases and Other Pests

TOPIC: Controlling Lawn and Turf Diseases

OBJECTIVES: To learn the major lawn, and turf diseases, and how to control them.

INTRODUCTION: It has been said that a landscape can be no better than the appearance of it's lawn. A house can be made into a beautiful home by maintaining a nice green lawn. There are several diseases which can severely damage the appearance of the turf if they are not controlled.

REFERENCES: Required:

"Texas Guide for Controlling Diseases on Ornamental Plants", Texas Agricultural Extension Bulletin -MP-574, pp. 24-26

QUESTIONS or ACTIVITIES:

1. What is the control for fairy rings or mushrooms?

2. What is the treatment for chlorosis?

3. What are the symptoms of fading out?

4 What is the treatment for slime mold?

5. What is the treatment for Piricularia leaf spot?

6 When should treatment for brown patch be applied?

7. When should treatment for rust on bluegrass be applied?

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Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Controlling Plant Insects, Plant Diseases and Other Pests

TOPIC: Identifying Plant Insects and Methods of Control

OBJECTIVE: To learn how to recognize the major insects of horticultural plants. To understand the various controls for these insects.

INTRODUCTION: On any given day, a producer may walk through his plants and see numerous insects, Some of these insects and pests are taking money from his pockets by damaging his crop. A person who is depending on the proper growth and development of plants needs to know which insects are of economic importance and how to control them.

REFERENCES: Required:

1. Basic Gardening Illustrated, section to study: "Insect Pests", pp. 78-79.
2. Information Sheet, "Identification of Plant Insects and Methods of Control."
3. "Texas Guide for Controlling Insects on Ornamental Plants", Texas Agricultural Extension Bulletin-L-199. (Study list of insects, descriptions and types of damage.)

Supplemental:

4. "Texas Guide for Controlling Insects and Diseases", Texas Agricultural Extension Bulletin-L-245.

QUESTIONS or ACTIVITIES:

1. What is the difference between a snail and a slug?
2. At what time of year do grasshoppers hatch?
3. What are the best methods of controlling borers?

UNIT: Controlling Plant Insects, Plant Diseases and Other Pests
TOPIC: Identifying Plant Insects and Methods of Control
(Assignment Sheet continued)

4. What part of the plant do grubs damage?
5. In what type of soil are nematodes most active?

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Assistant Groundskeeper 944-VIII-9

Information Sheet
on
IDENTIFYING PLANT INSECTS AND METHODS OF CONTROL

Eternal vigilance and timely applications of effective controls will reduce losses to a minimum. Weeds in aisles or under benches are breeding places for a number of pests, and cleanliness is imperative. A generally overlooked area is that outside the greenhouse. Weeds harbor many pests which can enter through side or top vents and open doors at the ends of the greenhouses. Cleanliness and proper attention to the outside areas as well as under glass will reduce the sources of infestation.

Great changes have occured in the field of insecticides, and there is a wide array of materials which are useful in combating pests. New materials are constantly being added, and the horticulturist must keep informed as better insecticides are introduced.

Aerosol bombs have radically changed certain pest-control practices. Specific directions for their use cannot be given in general terms because they vary, and directions on the bombs should be followed closely. Alternation in the use of materials is suggested to avoid the rapid build-up of resistant strains of pests.

Resistance of mites to insecticides is believed to occur by mutation, which establishes populations that survive normal effective doses. This resistance is inherited and does not retrogress. Purchasing plants or cuttings infested with resistant mites can lead to considerable trouble.

Sprays and dusts are still used because in many instances they are just as effective as aerosols and may be cheaper for local applications. Many insecticides are deadly poisons, and precautions regarding their use will be found on the container and should be followed.

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Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Controlling Plant Insects, Plant Diseases and Other Pests

TOPIC: Nematodes

OBJECTIVE: To develop an understanding of nematodes as a serious pest.

INTRODUCTION: When leaves of plants are wilting, drying and falling off for no apparent reason, nematodes may be the cause. Nematodes are small, slender, worm-like parasites which cannot be readily seen by the naked eye. These pests are small, but they can completely destroy a plant.

REFERENCES: Required:

1. "What You Should Know About Plant Diseases", Texas Agricultural Extension Bulletin B-995, page 3, pp. 13-14.
2. "Identifying Plant Diseases", Texas Agricultural Bulletin MP-512.

QUESTIONS or ACTIVITIES:

1. List the steps involved in preparing a small plant specimen as illustrated in bulletin MP-512.
2. What is the most common type of nematode?
3. What should be determined before a large amount of money is spent on nematodes?
4. Knots and galls found on plant roots do not always indicate root knot nematodes. Give at least two exceptions.
5. Name two plants that are very good hosts for root knot nematodes.

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Assignment Sheet
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UNIT: Controlling Plant Insects, Plant Diseases, and Other Pests

TOPIC: Control of Moles, Gophers, Birds, and Deer

OBJECTIVE: To become familiar with animals and birds that are a nuisance to the producer of horticultural plants.

INTRODUCTION: Plant damage by animals and birds can become quite costly. The rural nurserymen usually have a big problem with animals, and the small town producers are plagued by flocks of birds.

REFERENCES: Required:

Basic Gardening Illustrated, page 82.

QUESTIONS or ACTIVITIES:

1. How can a person detect the presence of moles?
2. What are the two most effective means of destroying moles?
3. Why should traps be used with caution?
4. How do gophers and moles differ in their digging habits?
5. How do many gardeners who live in the country protect plant roots from gopher damage without using poisons or traps?
6. What birds have no friends and should be eliminated.?

7. What is the best way to protect young seedlings from birds?

8. What is the best long term control for deer?

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Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Controlling Plant Insects, Plant Diseases and Other Pests

TOPIC: Controlling Weeds

OBJECTIVE: To learn how to get rid of weeds and to prevent their recurrance.

INTRODUCTION: Weeds grow well without proper water and fertilizer. If you add these two ingredients, they will flourish and this produces a great deal of trouble. If not controlled, they can crowd out annuals and perennials and even small shrubs. Chemical, hand, and mechanical methods of control are all effective if you start early and are persistent.

REFERENCES: Required:

Basic Gardening Illustrated, pp. 84-86

QUESTIONS or ACTIVITIES:

1. If you are planning to pull up weeds in a bed, what should you do to the soil several days before starting?
2. What has been the gardeners most useful tool for over 4,000 years?
3. What is a good device for weeding between paving blocks?
4. How does encouraging shrub growth reduce weed population?
5. After weeds have been cleared, what can be done to prevent recurrence?
6. What precaution should be taken when mixing and applying chemical solution where handling is required?

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Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Operating and Maintaining Horticultural Equipment

TOPIC: Principles Used to Prevent Personal Injury

OBJECTIVE: To learn the techniques and principles involved in horticultural work that will prevent personal injury.

INTRODUCTION: Gardening and growing horticultural plants can be hard work. In many instances a little time spent constructing a labor saving device can save several hours of back-breaking work.

REFERENCES: Required:

Basic Gardening Illustrated, pp. 90-93.

QUESTIONS or ACTIVITIES:

1. What part of the body should do the lifting when you are picking up an object from the ground?
2. What effect does one pulley have on the force when you are attempting to straighten up a tree?
3. What can be used to remove a stump if no heavy equipment is obtainable?
4. What preparation should be made to clay soils before attempting to do a lot of digging?
5. Tell how to make a handy device for blasting post holes and planting holes.

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Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Operating and Maintaining Horticultural Equipment

TOPIC: Selecting and Maintaining Horticultural Hand Tools

OBJECTIVE: To learn to select the right tools for a job and to keep these tools in good repair.

INTRODUCTION: No situation is quite as distressing as trying to complete a job when the proper tools are not at hand.

REFERENCES: Required:

Basic Gardening Illustrated, pp. 88-89;94.

QUESTIONS or ACTIVITIES:

1. Why will asking different gardners for a suggested tool list be of little value?
2. What type of shovel is effective for moving sawdust, manure, and other light materials?
3. What is the most common size of hoe?
4. How often should one sharpen a hoe if the cutting is not too hard?
5. What type of hoe is used by a pushing motion rather than a chopping motion?
6. What are the two most common shapes of lawn rakes?

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Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Operating and Maintaining Horticultural Equipment

TOPIC: Maintaining Small Power Equipment

OBJECTIVE: To develop the ability to maintain small powered equipment.

INTRODUCTION: Value of small powered equipment quickly decreases if proper maintenance practices are not diligently followed. Preventing a breakdown is usually much easier than repairing one.

REFERENCES: Required:

Information Sheet, "Maintaining Small Power Equipment."

QUESTIONS or ACTIVITIES:

1. What are the two factions of preventive maintenance?
2. What should an operator of equipment do at the end of each work day?
3. Why should the fuel tank be filled at the end of the day?
4. What may be used to clean the air filter?
5. What two factors should be considered when checking a belt?

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Assistant Groundskeeper 944-IX-3

Information Sheet
on
MAINTAINING SMALL POWER EQUIPMENT

Small, engine-powered equipment quickly loses its value if it is not carefully maintained. Profitable use of the equipment depends on trouble free operation on the job. While no equipment, no matter how well maintained, can be guaranteed not to break down on the job, "down time" can be extremely short if a careful maintenance program is followed. Human and livestock health care is of a preventative nature. Equipment maintenance should be similar.

Preventive maintenance can be described as consisting primarily of two things:

1. Periodic equipment inspection to discover situations which may lead to equipment breakdown.
2. Upkeep to minimize wear or to remedy potential trouble.

Regularly used equipment should always be checked by the operator. Should he notice any slight malfunction, he should correct it before further trouble develops. The operator should see that field maintenance is carried out regularly.

Usually not enough horticultural equipment is operated by a horticultural business to warrant hiring a full-time field mechanic or serviceman. The operator has the responsibility to check oil, apply grease, and perform other maintenance when needed. In some instances, this may be required every few hours. At the end of the day, the operator should make an overall check and properly service his equipment. This will make the equipment ready to use the next day or on any future date it may be needed.

A regular program of shop maintenance should be carried out on each piece of small engine powered equipment. Small engines have prescribed periods of operating time after which oil should be drained and replaced. At that time a general check of the equipment is in order.

Before beginning operation of a small, engine-powered piece of equipment the following should be checked:

Maintaining Small Power Equipment
(Information Sheet continued)

1. **Fuel**
2. **Engine oil level**
3. **Oil level and air filter**
4. **Belt tension**
5. **Chains, oil if necessary**
6. **Moving parts requiring frequent applications of grease or oil**
7. **Gearboxes**
8. **Implement adjustments**

During operation, the operator should constantly watch for any slight malfunction. Often a change in the sound of the machine when in operation will indicate the beginning of trouble. A skilled operator can tell by the sound of the machine if everything is in good working order. If equipment is used for long periods during the day, regular shutdowns for preventive maintenance practices are advisable.

When equipment has been shut down for the day, it should carefully be checked and readied for the following day's operation.

1. **Fuel - Fill the fuel tank. Moisture condenses more rapidly in a partially empty tank as the air cools.**
2. **Oil - check the oil level and add oil as required. The oil should be changed periodically.**
3. **Transmission case - check the lubricant level; adding or changing the lubricant as necessary.**
4. **Oil filter - clean and check the oil level.**
5. **Chains - apply oil to chains at regular intervals. Check the condition of the links.**
6. **Belt condition - check belts for excessive wear and for proper tension.**
7. **Moving parts - grease all moving parts.**

Maintaining Small Power Equipment
(Information Sheet continued)

8. Cutting surfaces - clean and check cutting surfaces of plows, cultivator tines and mowers for sharpness. Cover cutting surfaces with used oil or grease if the machine is to sit out in the weather or not be used over a period of time.
9. Adjustment - check machine to be sure that all operating parts are in correct adjustment.
10. Bolts - inspect the machine for missing and/or loose belts.
11. Damaged or broken parts - determine if any parts have been damaged to the extent that machine operation will be impaired. Replace these and all broken parts to insure proper operation.
12. Machine cleanliness - clean off accumulated dust and dirt regularly.

When small, engine-powered equipment is put away for the off-season give special care to provide the maintenance necessary to insure rapid starts the following season.

The following general procedure should be used. However, check the operators' manual for specific maintenance procedures which may be needed for a particular piece of equipment.

1. Before beginning the check, disconnect spark plug wire to eliminate a possible accident.
2. Using wire brushes, scrapers, rags, and chemical de-greasers clean the entire machine. Use chemicals only outdoors.
3. Clean air filter. Rinse with gasoline or other solvent, wipe dry, and refill with oil. If the air filter has a dry element, replace with new element according to manufacturers recommendations.
4. Check carburetor for sediment. Remove and check if necessary.
5. Re-connect spark plug wire and run engine for five minutes. Stop the engine, remove the spark plug wire and drain the crankcase oil. Fill with new oil as recommended by the manufacturer.

Maintaining Small Power Equipment
(Information Sheet continued)

6. Drain gas tank. Reconnect spark plug wire, start the engine, and run until the tank and carburetor are free of gasoline.
7. Remove spark plug and pour a teaspoonful of oil into the cylinder. Turn the flywheel to distribute oil. Replace the spark plug with a new one.
8. Adjust and/or sharpen any blades or implements.
9. Grease or oil any moving parts.
10. Wipe a light coating of oil over bare metal parts.
11. Store in a protected, dry place.

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Material for this Information Sheet was taken from Module 10, "Operating, Repairing, and Maintaining Small Power Equipment," Center for Vocational and Technical Education, The Ohio State University, Columbus, Ohio.

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944-IX-4

Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Operating and Maintaining Horticultural Equipment

TOPIC: Operating and Maintaining Lawn Mowers Safely and Effectively

OBJECTIVE: To learn how to properly operate and to care for a lawn mower.

INTRODUCTION: A well mowed lawn can greatly increase the beauty of a home. There is more to operating a lawnmower than filling it with gasoline and mowing the grass.

REFERENCES: Required:

1. Basic Gardening Illustrated, page 94, "Lawn Mowing".
2. Information Sheet, "Operating and Maintaining Lawn Mowers Safely and Effectively".

QUESTIONS or ACTIVITIES:

1. What are the three general categories of power mowers?
2. What is meant by scalping a lawn?
3. What is the first step in adjusting the cutting height of a power mower?
4. A sickle bar mower consists primarily of what two parts?
5. Why should extremely long grass clippings be removed from the lawn?
6. Explain why grass leaves whould never be clipped too short?

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Information Sheet
on
OPERATING AND MAINTAINING LAWN MOWERS SAFELY AND EFFECTIVELY

Power mowers can be divided into three general categories: (1) reel, (2) rotary, or (3) sickle bar.

Reel Mowers. A reel mower is basically a common hand push mower powered by a small gasoline engine. As the mower moves forward, the revolving blades slide past the bed knife and cut the grass blades.

Reel mowers used on bluegrass and similar grasses have five revolving reel blades. Reel mowers used on the bent type grasses have seven or nine blades to provide a smooth, even cut on these fine-bladed grasses.

Reel mowers minimize the tendency of scalping, or extremely close cutting on the high spots of an uneven lawn. Repeated scalping will result in a weak turf at those spots.

The procedure for adjusting height of cut varies for each make of reel mowers. In general the following procedures apply:

1. Disconnect the spark plug wire from the spark plug and place it in a position where it is impossible for a spark to jump an air gap to the plug, possibly causing accidental starting.
2. Place mower on a perfectly flat, hard surface, such as a concrete walk or solid workbench.
3. Adjust the bed knife to the proper height by manipulating the height adjusting set screws or by adjusting the wheel height.
4. Check to see that the adjustment procedure has not distorted the bed knife. Rotate the reel and check the clearance between reel blades and bed knife for the entire length of each of the reel blades. This clearance should be uniform along the length of each blade. If this cannot be achieved through adjustment, it will be necessary to utilize special equipment to grind the blades to obtain the desired clearance.

Rotary Mowers. Rotary mowers have a vertical shaft engine mounted on a housing which encloses a horizontally revolving blade. The blade may be mounted on the engine shaft, or one or more blades may be mounted on vertical jackshafts. As the mower moves forward, the blade revolves at very high speeds lifting and cutting off the grass blades. Rotary mowers are generally simpler in construction than reel mowers.

Operating and Maintaining Lawn Mowers
Safely and Effectively
(Information Sheet continued)

Scalping or extremely close cutting of high spots on uneven turf, can easily occur through careless operation. Because the rotary mower is relatively square in design, the wheels may pass over a high spot and drop into a lower area during mowing and cause the blade to crop near to or hit the soil surface. Excessive scalping may severely damage the turf.

Rotary mower adjustment varies in detail according to the make; but the following general procedures usually apply:

1. Place mower on a perfectly flat, hard surface, such as the concrete walk or a solid workbench. Remove spark plug wire so as to prevent the possibility of accidental starting which might result in serious injuries.
2. Adjust mower blade to proper height by adjusting wheel height in relation to the housing. Be sure to check the blade height and not the housing height since the blade is not level with the lower edge of the housing.
3. Adjust mower handle height to suit operator.

Rotary mower blades should be sharpened regularly, since a dull blade rips, instead of cutting the grass. Before removing the blade for sharpening, disconnect the spark plug wire. The blade may be sharpened by grinding or by filing. Prior to remounting, the blade must be balanced. The blade is mounted on a rod which is the same diameter as the hole in the blade. Place the ends of the rod on a hard, perfectly flat surface with room for the blade to revolve freely. Two short pieces of 2" x 4" hard wood would work. After resting the ends of the rod on the 2 x 4's, the blade should remain level. If the blade is not balanced, grind or file the heavier end until perfect balance is achieved.

Individual knives mounted on a base plate should be weighed after grinding to check their balance. If necessary, metal may either be ground off the back of the knife or holes may be drilled in the back of the knife to remove excess weight so that perfect balance can be achieved.

Sickle Bar Mowers. Sickle bar mowers are used to cut overgrown turf or heavy weeds. They generally do not cut neatly enough for use on home, industrial, or recreational lawns.

Sickle bar mowers consist primarily of a cutter bar and knife. The knife is a narrow steel bar to which several triangular-shaped, sharp, knife sections are riveted. The knife is driven by a pitman rod through a series

Operating and Maintaining Lawn Mowers
Safely and Effectively
(Information Sheet continued)

of guards and over numerous wear plates. As the cutter bar moves forward, grass blades are cut by a scissor-like action as the knife moves rapidly back and forth over the wear plates.

The sickle cutter bar is usually mounted on and powered by a garden tractor or is permanently mounted and powered by a specially-designed power unit.

Height-of-cut adjustment is not present on some sickle bar mowers. On other makes, height adjustment is made by raising or lowering a steel "foot" which rides on the ground and keeps the mower at a set level.

Correct mowing techniques greatly influence the health, vigor, and appearance of a lawn.

Leaves of the grass plant are essential to producing food for plant growth. When cut off too low, the food producing section of the leaf is lost and turf vigor quickly declines.

Grasses similar in height to the bluegrasses should be cut to a height of 1 1/2 to 2 inches. Low growing grasses of the creeping bent types should be mowed to a height of about 1/2 to 3/4 inch.

If the lawn is mowed frequently enough, clippings need not be removed. They filter down to the surface of the soil and act as a beneficial mulch for the turf. If the clippings are excessively long, they must be removed since they may smother the grass. Under certain conditions, some lawns develop excessive "thatch," dense mats of dead grass and clippings, at the soil surface. Under such circumstances, all clippings should be removed.

The mowing pattern should be varied each time the lawn is mowed to eliminate low spots, corrugations, and some matting. The changed lawn patterns created by changing mowing directions also enhance the overall landscape appearance.

Overlapping each opposing cut improves the lawn appearance. Mowing in the opposite direction of the previous cut and overlapping past the wheel mark of the previous cut can raise grass that may have been matted down by the wheels and permit it to be cut.

Operating and Maintaining Lawn Mowers
Safely and Effectively
(Information Sheet continued)

Safety should be foremost in the mind of any equipment operator. He should know his mower and its capabilities and should attempt only jobs for which the equipment is designed. Except for adjusting the carburetor, he should never place his hands in or near moving parts, nor allow anyone else, especially children, to be nearby when the engine is running. When the engine is stopped for cleaning or repairs, the spark plug wire should be removed to eliminate the hazard of accidentally starting the engine. The operator of a rotary mower should be constantly on guard against running over articles such as glass or stones which could be thrown by the blades of the mower, since such debris can cause severe injury to people or pets.

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Material for this Information Sheet was partially taken from Module no. 10, "Operating, Repairing, and Maintaining Small Power Equipment." Center for Vocational and Technical Education, The Ohio State University, Columbus, Ohio.

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944-IX-5

Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT:	Operating and Maintaining Horticultural Equipment
TOPIC:	Operating Rotary Tillers Safely and Effectively
OBJECTIVE:	To learn the different types of tillers and how to properly operate them.
INTRODUCTION:	A rotary tiller can be a handy piece of equipment. It can also be dangerous. One should exercise extreme caution in the operation of these machines. If cautions are heeded, a tiller can be used by even the inexperienced gardener to loosen soils and in preparing soil mixtures.
REFERENCES:	Required: Information Sheet, "Operating and Maintaining Rotary Tillers Safely and Effectively."

QUESTIONS or ACTIVITIES:

1. What are the two categories of rotary tillers?
2. Which type is used only for light work?
3. On front tine tillers, what moves the tiller forward?
4. If the front tine tiller digs too far into the ground and does not move forward, what should you do?
5. What should be done before starting any tiller?

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Assistant Groundskeeper 944-IX-5

Information Sheet
on

OPERATING ROTARY TILLERS SAFELY AND EFFECTIVELY

Rotary tillers are classified into two categories according to the arrangement of the tilling tines. Front tine tillers are those which have the tines located in front of the wheels. Rear tine tillers have the tines located behind the wheels.

Front tine tillers are generally designed for light-duty and are often used for cultivating. In a loose soil they may do a satisfactory job of tilling to a depth of several inches. The machines usually are not heavy enough to till deeper on loose soils or to till heavy clay-packed soils with heavy vegetative cover.

Front tine tillers do not have power wheels. The rotation of the tines causes the tiller to move forward. Some control can be exerted over rate of forward motion by adjusting the depth bar. If the tiller must be held back to do a proper job of tilling, the depth bar should be lowered to cause the tines to dig deeper and slow the rate of forward speed. If the tiller digs deeply and does not move forward, determine the adjustment of the depth bar.

Rear-tine rotary tillers are designed for medium to heavy work. Excellent tilling can be done to depths of about eight inches in a variety of soils having various amounts of vegetation or organic matter. This type of tiller can thoroughly mix organic matter into the soil.

Rear tine tillers have powered wheels and usually a reverse gear. Power can be transferred to either the wheels or the tines. Rate of forward speed is controlled by selection of proper gear and throttle setting.

Tilling depth on rear tine tillers is also adjusted by a depth bar which is usually located behind the tines. The bar is raised for increased tilling depth and lowered for decreased depth.

Since rear tine tillers are often used on heavy or packed soils, several points of operation should be noted. The following operational procedures should be observed:

Operating Rotary Tillers Safely and Effectively
(Information Sheet continued)

1. Rotary till when soil moisture is correct. Use standard method of squeezing a handful of soil to determine moisture content. When the soil ball flakes and cracks, soil has the correct moisture content for tilling.

2. First run tilling depth should be no more than one to two inches. Increase depth for each additional pass.

3. Final tilling passes should be at right angles to previous ones to break down lumps further.

The handling procedures for front and rear tine tillers are considerably different. Each type can pose safety hazards to careless operators. Before starting any tiller, check to see all clutches, or belt tension pulleys are disengaged. The load on the engine may be great enough to prevent the engine from starting if clutch is engaged, the machine may get away from the operator and cause personal injury or property damage. Even if the engine does not start while the clutch is engaged, a sharp pull on the starting rope may upset the machine or injure the operator.

Rear tine tillers present added hazards to the operator. Power to the tiller tines should be disengaged whenever the tiller is not being used for tilling. This includes turning the machine around when moving it from one site to another.

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Material for this Information Sheet was taken from Module 10, "Operating and Maintaining Small Power Equipment." Center for Vocational and Technical Education, The Ohio State University, Columbus, Ohio.

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944-IX-6

Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Operating and Maintaining Horticultural Equipment

TOPIC: Operating Garden Tractors Safely and Effectively

OBJECTIVE: To learn how to operate a garden tractor safely and effectively.

INTRODUCTION; The sale of garden tractors has increased steadily in the past few years. These tractors are used in a number of horticultural enterprises as well as by homeowners and hobby gardeners.

REFERENCES: Required:

1. Information Sheet, "Operating Garden Tractors Safely and Effectively".

Supplemental:

2. Literature from manufacturers of garden tractors.

QUESTIONS or ACTIVITIES:

1. If one is planning to buy a garden tractor and a sickle bar, what should he keep in mind in regard to tractor size?
2. What is the usual horsepower range of small riding tractors?
3. Where should one attach pulled equipment to avoid tipping a tractor backwards?
4. What is the major difference between small riding type garden tractors and riding lawn mowers?
5. What are the two most widely used types of transmissions on garden tractors?

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Assistant Groundskeeper 944-IX-6

Information Sheet
on
OPERATING GARDEN TRACTORS SAFELY AND EFFECTIVELY

The small walking or riding type garden tractor is used in a number of horticultural enterprises as well as by homeowners and hobby gardeners.

Walking type tractors have had the same basic design for a number of years, but moderate improvements such as rubber tires, have been introduced.

The basic design consists of a small gasoline engine mounted on a set of wheels attached to a pair of handles. Power is usually transmitted from the engine through a reduction gear arrangement to a jackshaft. An idler, or belt tension pulley, is mounted for the belt between the gear box and jackshaft. This provides the clutch for the tractor.

The power is transmitted from the jackshaft to the wheels by a chain or belt arrangement.

Extra pulleys may be mounted on either the gearbox shaft or the jackshaft to permit use of implements requiring power.

A number of implements are available for walking tractors. Those requiring power, such as sickle bars or snow blowers, demand engines of high horsepower and tractors of heavier design. Many implements are simply pulled or pushed by the tractor and often can be used with tractors of lower horsepower and lighter weight.

Implements are attached to the walking tractor in two basic ways with minor modifications according to the various manufacturers. Implements which are pulled are attached by a vertical rod or "pin" which secures the tool to the tractor frame behind the engine.

Implements which are pushed by the tractor are rigidly secured to the frame in front of and under the engine with several bolts or pins.

The following implements are available for most walking tractors:
Cultivator
Plow
Disc
Reel mower
Sickle bar mower
Cart
Seeder
Fertilizer spreader
Lawn roller
Rotary roller
Sulky
Grader blade

The tractor engine can also be used to power a number of other stationary pieces of equipment, such as a small rotary cement mixer, saw, compressor, compost or soil shredder, and others.

The walking tractor is a versatile piece of equipment which, in many horticultural enterprises, can supplement heavy equipment. Operators of small walking tractors should, however, be familiar with the equipment since too often the tractor is damaged and the operator injured where it is used for too heavy work. Quite often the walking tractor is not properly maintained since it is relatively inexpensive and possibly not used as often as larger equipment. Because regular maintenance schedules are often neglected, premature equipment failure may result.

Within the past decade, a small type of riding tractor has been developed. Most are scaled-down versions of the larger types. Horsepower ranges from 3 1/2 to 10. Due to the heavier weight of the machine and the added rider weight, the unit can handle somewhat heavier jobs than most walking tractors.

While all small riding tractors can handle mower attachments, they are not riding mowers. Riding mowers are quite different from small garden tractors, in that riding mowers are built to be used for mowing grass only. The high interest in small riding tractors by homeowners with large lots has resulted in scores of different models produced by various manufacturers.

The construction varies considerably in type as well as quality. For example, some models have automotive type clutches, some centrifugal clutches, and others, a belt-pulley type clutch. Transmissions also vary considerably; some have an automotive type while others have a belt type.

The teacher should obtain a variety of manufacturers' literature giving detailed specification of the various types of tractors.

The list of equipment available for small riding tractors is the same as that listed for small walking tractors.

Since the small riding tractors are basically a small-scale, standard tractor, several similar rules of operation should be kept in mind. All pulled equipment should be attached properly below the rear axle level to avoid tipping the tractor backwards if the load is too great. Care should be taken when operating the tractor on uneven or sloping ground to avoid turning over. The operator of a walking tractor can usually move out of the way quickly in the event of an upset, but the operator of the riding tractor is in a more precarious position.

Operating Garden Tractors Safely and Effectively
(Information Sheet continued)

Both walking tractors and small riding tractors can be valuable tools for a horticultural business or for the homeowner with a large lot. For maximum value, however, they should be used only to the rated capacity of the unit, on jobs for which implements are available, and in situations where their use can be justified economically.

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Material for this Information Sheet was taken from "Operating, Repairing, and Maintaining Small Power Equipment". Center for Vocational and Technical Education, The Ohio State University, Columbus, Ohio.

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Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Developing and Maintaining the Landscape

TOPIC: Introduction to Home Landscaping

OBJECTIVE: To develop an understanding of why landscaping has become important and to learn sources of information available to the beginner.

INTRODUCTION: By properly landscaping a home it's value can be greatly increased. The landscaping industry has grown in leaps and bounds during recent years. This growth is probably caused by the great number of people moving to the urban and suburban areas. It seems that everyone tries to have a better landscaped lawn than his neighbor. Another factor which has contributed much to the landscaping business is the greater amount of leisure time now enjoyed by American people. Many have found that working in a flower garden or watering the lawn is quite enjoyable and provides a form of relaxation which is very refreshing in this hurry-up world in which we live.

REFERENCES: Required:

1. "Home Landscaping", Texas Agricultural Extension Bulletin B-980, pp. 3-4.

Supplemental:

2. Approved Practices in Beautifying the Home Grounds, Hoover.

QUESTIONS or ACTIVITIES:

1. What are the three basic fields of endeavor involved in landscaping?
2. List the four main types of home owners.
3. Why can gardens no longer be entirely naturalistic?

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UNIT: Developing and Maintaining the Landscape
TOPIC: Introduction to Home Landscaping
(Assignment Sheet continued)

4. Why do landscaping plants vary so greatly from one side of Texas to the other?

5. How do some large nurseries which provide "free" landscape plans get their money back for the time and expense which they provide?

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944-X-2

Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Developing and Maintaining the Landscape

TOPIC: Selecting a Site

OBJECTIVE: To develop an understanding of the considerations to make when purchasing a home.

INTRODUCTION: Many people forget about landscape design when they are shopping for a new home. After the house is purchased, the owner then looks at his landscape potential. Many times, to his dismay, the landscaping will present special problems which require considerable expense.

REFERENCES: Required:

"Home Landscaping", Texas Agricultural Extension Bulletin B-980, pp. 4-5.

QUESTIONS or ACTIVITIES:

1. What should be the first consideration as to home-site?
2. What is meant by zoning?
3. Can most families afford to spend one-half of their annual income on a lot?
4. List some disadvantages of a corner lot.
5. List two disadvantages of sites that are too far above the street.
6. What direction should outdoor living areas face? Why?

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944-X-3

Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Developing and Maintaining the Landscape

TOPIC: Scheduling Landscape Development and Beginning Plans

OBJECTIVE: To develop an understanding of how to schedule your landscape development and to learn how to begin the landscape plan.

INTRODUCTION: Successful landscapes are a result of proper scheduling and planning. Few beginners can see all of the problems which will arise in landscaping a lawn. It is wise to spend considerable time in reading material written by specialists before drawing the plans.

REFERENCES: Required:

"Home Landscaping", Texas Agricultural Extension Bulletin B-980, pp. 5-9

QUESTIONS or ACTIVITIES:

1. Describe a well planned garden.
2. What are the most essential elements of the plan that should be constructed first?
3. Why are trees so important in Texas landscapes?
4. What are the purposes of hedges, screens, walls, and fences?
5. What are the two important steps involved in solving a landscape problem?
6. What is meant by "site"?

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944-X-4

Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Developing and Maintaining the Landscape

TOPIC: Analyzing Problems and Determining Needs

OBJECTIVE: To develop an understanding of the specific problems which will be encountered on certain sites and to become aware of the four basic considerations which should be included in successful landscape development.

INTRODUCTION: Four basic considerations should be included in successful landscape development. These are suitability, function, economy, and beauty.

REFERENCES: Required:

"Home Landscaping", Texas Agricultural Extension Service, pp. 9-12

QUESTIONS or ACTIVITIES:

1. List the four basic considerations which should be included in successful landscape development.
2. What is the basic step in the preparation of a program?
3. What three questions should you ask yourself in regard to outdoor surroundings?
4. What are the three economies to keep in mind in the development of a homesite?
5. What two factors determine beauty?
6. Can a beginner usually obtain simplicity in a landscape design?

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Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Developing and Maintaining the Landscape

TOPIC: Developing the Landscape Plan

OBJECTIVE: To develop an understanding of the steps involved in developing the landscape plan.

INTRODUCTION: Planning is the means of accomplishing an objective through an arrangement of steps. A properly designed and executed plan will result in a landscape of a desirable nature.

REFERENCES: Required:

"Home Landscaping", Texas Agricultural Extension Bulletin B-980, pp. 12-15

QUESTIONS or ACTIVITIES:

1. When should planning begin?
2. What scale is used on the sketch survey on page 13?
3. What are the four main functions that all homesites and farmsites must provide?
4. What area should occupy the largest portion of the property?
5. Around which area of the house should private areas be developed?
6. What were the two approaches to landscaping which were followed in years past?

Activity:
Study the areas in Texas where plants vary.

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944-X-6

Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Developing and Maintaining the Landscape

TOPIC: Selecting Plants

OBJECTIVE: To develop an understanding of how to select the proper plants to be used in a landscape.

INTRODUCTION: One must be very careful in selecting plants for a landscape. Otherwise, he may plant a monument to his ignorance. An example would be planting a tree that would grow high enough to damage the roof of the house.

The completed plantings are the final mark of distinction in any landscape. These are the elements that provide beauty and enrichment to the solution of the landscape problem.

REFERENCES: Required:

"Home Landscaping", Texas Agricultural Extension Bulletin B-980, pp. 20-26

QUESTIONS or ACTIVITIES:

1. How tall are large shrubs or small trees when they are full grown?
2. How tall do medium shrubs get?
3. How are shrubs classified that do not grow higher than three feet?
4. What is the danger involved in planting trees with deep, wide-spreading roots?
5. What type of tree is desirable for the warmer regions of Texas where year-round shade is needed?
6. What duties are required for proper lawn maintenance?
7. Give two examples of fast growing hedges that require frequent clipping.

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Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Developing and Maintaining the Landscape

TOPIC: Grading, Drainage, and Landscape Structures

OBJECTIVE: To develop an understanding of the grading and drainage factors and to learn how landscape structures should be constructed.

INTRODUCTION: Every homesite will require some grading to permit proper drainage. There are many factors to be considered before grading. It must be kept in mind that water directed to certain areas could cause damage to plants.

The construction of sidewalks and drives is expensive. Be sure of your planning before the concrete is poured.

REFERENCES: Required;

"Ground Landscaping", Texas Agricultural Extension Bulletin B-980, pp. 27-30

QUESTIONS or ACTIVITIES:

1. Although not the most desirable, what is the most inexpensive way of preventing water from downspouts from washing away soil?

2. Does lowering the grade around existing trees damage trees as much as filling in around them?

3. When you need to save a valuable tree, what method will least disturb the tree?

4. What is the most common mistake when constructing sidewalks?

5. What should be the minimum width of a front entrance sidewalk?

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Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Developing and Maintaining the Landscape

TOPIC: Winter Protection Structures

OBJECTIVE: To learn the various techniques involved in protecting plants from winter damage.

INTRODUCTION: A hard freeze can ruin a whole vear's work. Plants that have been cared for and protected all year can be killed in just a short period of time by the freezing winds of winter.

REFERENCES: Required:

Basic Gardening Illustrated, pp. 72-73

QUESTIONS or ACTIVITIES:

1. What should you notice during the first couple of light frosts?
2. Why should soil be kept damp during a frost?
3. How do hotcaps work?
4. How do you arrange outdoor heaters in a small orchard?
5. What are four telltale signs of a coming frost?

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944-X-9

Assignment Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Developing and Maintaining the Landscape

TOPIC: Structures for Summer Heat Protection

OBJECTIVE: To learn how to protect plants from damage by summer heat.

INTRODUCTION: The subject of shade for plants is often neglected by beinning horticulturists. Many people who are said to have a "green thumb" are excellent plant producers because they properly care for their plants during the summer months.

REFERENCES: Required:

Basic Gardening Illustrated, pp. 70-71

QUESTIONS or ACTIVITIES:

1. What are the three main functions of shades?
2. Which direction should a permanent shade structure face in hot summer areas?
3. What are two good materials that can be stretched over lath frames to lean against walls to protect seedlings in flats?
4. What direction should the laths run on a sunscreen?
5. How can you stiffen the frame when making a lath screen?

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Answer Sheet
for
PROSPECTIVE EMPLOYEES IN HORTICULTUAL OCCUPATIONS

UNIT: Introduction to Horticulture

TOPIC: Horticulture as an Industry

1. Vegetables

2. Fruits

3. a. Fruits
   b. Vegetables
   c. Flowers
   d. Ornamental plants

4. Small fruits

5. The out-of-season producltion in the South and West.

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Answer Sheet for Test on HORTICULTURE AS AN INDUSTRY

True or False:

1. False
2. True
3. True
4. False
5. False
6. False
7. False
8. True
9. True
10. False

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Answer Sheet
for
PROPSECTIVE EMPLOYEES IN HORTICULTURAL OCCUPATIONS

UNIT: Introduction to Horticulture

TOPIC: Exploring Occupational Opportunities

1. a. Laborer
   b. Foreman or Supervisor
   c. Assistant Manager
   d. Manager or Owner

2. To work on the job

3. Garden center employee. Probably others which are diversified in operation.

4. This answer depends on the local situations.

5. No written answer required. Coordinator should stress the importance of the student becoming thoroughly familiar with the 18 factors to consider in selecting a job.

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Answer Sheet for Test
on
EXPLORING OCCUPATIONAL OPPORTUNITIES

1. Refer to the eighteen factors listed in the information sheet. The student should have listed at least 10 factors, in his own words, which should be considered when evaluating the desirability of an occupation.

2. a. Greenhouse Worker
   b. Nursery Worker
   c. Garden Center Employee
   d. Assistant Groundskeeper
   e. Parks and Landscape Employee

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944-II-1

Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Growing Media

TOPIC: Origin, Composition, and Importance of the Soil

1. Topsoil, subsoil, and parent layer

2. Climate

3. Topsoil

4. When its first plant grows, dies, and decays

5. a. Different amounts of air present when soil is formed
   b. Amount of organic matter present
   c. Types of rock from which soil is formed

6. a. Fertilizer elements
   b. Air
   c. Adequate water

7. a. Sand
   b. Silt
   c. Clay

8. Sand

9. Climate, especially rainfall and temperature

10. Decayed plant or animal material

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Assistant Groundskeeper 944-II-1

Answer Sheet for Test
on
ORIGIN, COMPOSITION, AND IMPORTANCE OF SOILS

PART I:

1. Sand
2. Organic Matter
3. Temperature and rainfall
4. Flour
5. Particles

PART II:

1. a. Topsoil
   b. Subsoil
   c. Parent layer

2. a. Different amounts of air present when soil is formed
   b. Different amounts of organic matter
   c. Different rocks from which soil is formed

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Growing Media

TOPIC: Soil Moisture

1. Roots
2. Transpiration
3. Organic matter
4. During droughts
5. Size of soil particles and condition of the soil
6. Structure of soil particles is damaged
7. Organic matter
8. Air cannot get to the roots
9. Soaks in, runs off, evaporates

Answer Sheet for Test
on
SOIL MOISTURE

PART I: Fill in the blanks:

1. Capillary
2. Fine
3. Evaporates
4. Respiration
5. Aeration

PART II: True or False

1. False - This would tear down structure.
2. True - By adding organic matter.
3. False - Overwatering does this.
4. True
5. True

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Answer Sheet
for
Assistant Groundskeeper

UNIT: Plant Growing Media

TOPIC: Soil Moisture

1. Roots

2. Transpiration

3. Organic Matter

4. During droughts

5. Size of soil particles and condition of the soil

6. Structure of the soil particles is damaged

7. Organic Matter

8. Air cannot get to the roots

9. Soaks in, runs off, evaporates

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Assistant Groundskeeper 944-II-3

Answer Sheet for Test
on
SOIL MIXTURES

Fill in the blanks:

1. Loam

2. Organic matter

3. Sticky

4. Shredder

5. Shrink

List:

a. Uniformity
b. Disease free
c. Low soluble salts
d. Good drainage
e. Good moisture retention
f. No shrinkage
g. Ease of preparation and storage
h. Complete availability

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Growing Media

TOPIC: Mulches

1. a. Inorganic or processed
   b. Organic

2. Hard to hold in place and can become unsightly

3. Nitrogen

4. Mid-spring

5. Peat moss

6. Crushed stone, gravel chips, pebbles

7. a. Dilutes the soil and usually increases root growth
   b. Promotes soil granulation
   c. Improves and stabilizes soil structure
   d. Affects pH slightly
   e. Adds some fertilizer materials
   f. Leads to nitrogen deficiency in cases where carbonaceous materials are added
   g. Serves as food for micro organisms
   h. Introduces weed seeds in the soil in some cases

8. Any material applied to the surface of a soil primarily to conserve moisture, maintain a uniform temperature, and to help control weeds

9. Highly inflammable

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Answer Sheet for Test
on
MULCHES

PART I:

1. Peat moss
2. Mid-spring
3. Nitrogen
4. Heat
5. Asphalt

PART II:

1. b
2. c
3. c

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944-II-5

Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Growing Media

TOPIC: Fertilizer Nutrients

1. Nitrogen
   Phosphorus
   Potassium (potash)

2. Nitrogen

3. Potassium

4. a. Applying dry fertilizers when leaves are wet
   b. Planting seeds directly on a layer of fertilizer
   c. Spilling fertilizer in heaps on the lawn

5. Before a rain or watering

6. a. Carbon
   b. Hydrogen
   c. Oxygen

7. a. Calcium
   b. Magnesium

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Answer Sheet for Test on FERTILIZER NUTRIENTS

Fill in the blanks:

1. Nitrogen

2. Calcium

3. Wet

4. Below

5. Broadcast

List:

1. a. Nitrogen
   b. Phosphorus
   c. Potassium

2. a. Calcuim
   b. Magnesium
   c. Sulfur

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Growing Media

TOPIC: Soil Organisms

1. a. Bacteria
   b. Fungi
   c. Algae

2. 1/1000 of the weight of an acre foot of soil

3. Penetrate plant tissue and cause root damage

4. Causes a great number diseases

5. Convert nitrogen in the air to available nitrogen for plants (only certain bacteria)

6. a. Add organic matter
   b. Add lime
   c. Add moisture

7. a. Soil sterilization with steam
   b. Soil fumigation or drenching with chemicals
   c. Seed treatment

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Answer Sheet for Test
on
SOIL ORGANISMS

Fill in the blanks:

1. Bacteria

2. Organic matter

3. Protozoa

4. Fungi

5. Earthworm

List:

6. a. Soil sterilization with steam
   b. Soil fumigation or drenching with chemicals
   c. Seed treatment

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944-III-7

Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Growing Media

TOPIC: Soil Sterilization

1. a. To kill soil-borne insects
   b. To kill harmful bacteria, fungi, and virus organisms
   c. Destroy weeds
   d. Promote soil granulation

2. a. Existing steam boilers
   b. Portable oil-fired steam boilers
   c. Package steamers
   d. Bricked in permanent type boilers

3. Because of poor heat conduction and distribution

4. Soil thermometer

5. Burns roots

6. a. Soil temperature
   b. Soil moisture
   c. Soil texture
   d. Organic matter content
   e. Seals needed
   f. Soil type
   g. Depth of application

7. a. Avoid inhaling the material
   b. Avoid contact to the skin
   c. Allow sufficient time for aeration after the material is applied

8. Steam

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Answer Sheet for Test
on
SOIL STERILIZATION

PART I:

1. Steam
2. Nematodes
3. Two to three weeks
4. Root burn
5. Instantly

PART II:

1. a. To kill soil borne insects
   b. To kill harmful bacteria, fungus
   c. To destroy weeds
   d. Promote soil granulation

2. a. Avoid inhaling the material
   b. Avoid contact of fumigant with skin
   c. Allow enough time for aeration after material is applied

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944-III-8

Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Growing Media

TOPIC: Plant Growing Media Other Than Soil

1. Sand

2. Brown to black

3. 10 to 20 times its own weight

4. Expands or explodes

5. a. Maple
   b. Oak
   c. Sycamore
   d. Elm

6. Shredded bark, sawdust, and wood shavings

7. They failed to add nitrogen.

8. a. Safe and easy to use
   b. Chemically inert
   c. Completely sterile
   d. Excellent water retention
   e. Long lasting
   f. Specially graded

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Assistant Groundskeeper 944-III-8

Answer Sheet for Test
on
PLANT GROWING MEDIA OTHER THAN SOIL

1. Sand
2. 10 to 20
3. Vermiculite
4. Southern
5. Nitrogen
6. Acid
7. Peat

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Growth and Classification

TOPIC: Introduction

1. Study of plants

2. Over 350,000

3. Sugar and starches

4. Plants have the ability to produce food from carbon dioxide and water.

5. Van Helmont concluded that plants produced wood almost completely from water.

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Assistant Groundskeeper 944-III-1

Answer Sheet for Test
on
INTRODUCTION

1. Botany
2. 350,000
3. Sugars, starches
4. Water
5. Carbon dioxide and water

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944-III-2

Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Growth and Classification

TOPIC: Photosynthesis

1. Light

2. To combine or to put together

3. The combining of carbon dioxide and water by the chlorophyll of living plants in the presence of light.

4. Amount of heat required to raise the temperature of a gram of water one degree centigrade.

5. A combination of atoms

6. Diffusion

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Answer Sheet to Test
on
PHOTOSYNTHESIS

1. Diffusion

2. Photo

3. Atoms

4. (in any order)
   a. Carbon dioxide
   b. Water
   c. Chlorophyll
   d. Light

5. Molecule

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944-III-3

Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Growth and Classification

TOPIC: Respiration

1. The release of chemical energy

2. Carbon dioxide and water

3. They are just the opposite.

4. Carbon dioxide

5. Food and oxygen

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Answer Sheet for Test
on
RESPIRATION

1. Food, oxygen
2. Stored
3. Decreases
4. Carbon dioxide
5. Respiration

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944-III-4

Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Growth and Classification

TOPIC: Water Absorption and Loss--Nutrient Absorption--Movement of Nutrients and Water in the Plant

1. The plant will wilt

2. Turgid

3. If you add too much fertilizer around the roots, water absorption is slowed down because most fertilizers, chemically speaking, are salts. This can cause the plant to wilt.

4. Loss of water from the plant as a vapor

5. Elements, or groups of elements, needed for plant growth.

6. Xylem, Phloem

7. If you girdle a tree properly, you remove the phloem and leave the xylem intact. In this way water and soil nutrients continue to move up to the top of the tree, but you prevent the movement of plant foods from the leaves to the roots. After six months to two years, the tree will usually have used up its stored food supply in the roots and it will die.

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Answer Sheet for Test
on
WATER ABSORPTION AND LOSS--NUTRIENT ABSORPTION--MOVEMENT OF WATER AND NUTRIENTS IN THE PLANT

1. Nutrients

2. Xylem, phloem

3. Bleeding

4. Transpiration

5. Root hair

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944-III-5

Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Growth and Classification

TOPIC: Plant Food

1. Any substance which can be used as a source of energy for carrying on the life processes

2. a. Carbohydrates
   b. Fats
   c. Proteins

3. a. Carbon
   b. Hydrogen
   c. Oxygen

4. Energy

5. Seeds

6. Hydrogenation

7. a Carbon
   b. Hydrogen
   c. Oxygen
   d Nitrogen
   e Sulfur
   f. Sometimes phosphorus

8. a. Carbon
   b. Hydrogen
   c. Oxygen
   d. Nitrogen

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Assistant Groundskeeper 944-III-5

Answer Sheet for Test
on
PLANT FOOD

1. Cellulose

2. Fat

3. Protein

4. a. Carbon
    b. Hydrogen
    c. Oxygen
    d. Nitrogen

5. Essential

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944-III-6

Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Growth and Classification

TOPIC: The Plant Kingdom

1. Study of the classification and naming of plants

2. a. Thallus plants
   b. Mosses and liverworts
   c. Ferns and club mosses
   d. Seed plants

3. Thallus plants

4. The helpful soil organisms and the nitrogen-fixing organisms found in legume nodules

5. Fungus

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Assistant Groundskeeper 944-III-6

Answer Sheet for Test
on
THE PLANT KINGDOM

1. Thallus
2. Flowering parts
3. Beneficial
4. Algae
5. Four

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Propagation

TOPIC: Introduction to propagation

1. Plant propagation is the controlled reproduction of plants in order that man can have selected plants which are of specific value to him.
2. Sexual or asexual
3. Greenhouses, hotbeds, and propagating case
4. Ventilation, temperature, shade and light
5. Loose, light, free from seeds, nematodes and disease organisms
6. Sand, peat, sphagnum moss, vermiculite and perlite
7. Methyl bromide
8. Clay pots, peat pots, and plant bands
9. To promote rooting of cuttings
10. Small rectangular containers used for seed germination

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Answer Sheet for Test
on
INTRODUCTION TO PROPAGATION

PART I:

1. Sexual or asexual
2. Ventilation, temperature, shade, and light
3. Methyl bromide
4. Seeds, nematodes, and disease organisms
5. Clay pots, peat pots, and plant bands

PART II:

1. T
2. F
3. T

1983

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944-IV-2

Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Propagation

TOPIC: Propagation from Cuttings

1. Cheaper, faster, maintains the characteristics of the original plant

2. Winter months or dormant season

3. Coleus, chrysanthemum, geranium, and carnation

4. From new growth in spring or early summer

5. 60-70° at night, 75-85° during the day. Rooting medium 70-75°

6. Serves as a protective layer which retards the development of decay on cuttings that are fairly slow to root.

7. a. Should come from a healthy and moderately vigorous plant
   b. Should come from average growth from portions of a plant in full sun
   c. Should be three to five inches long with two or more nodes

8. One which can be kept uniformly moist, provide good drainage and aeration

9. a. Clean-sharp sand
   b. Vermiculite
   c. Sand and peat moss mixture, equal parts of each
   d. Peat moss and perlite, equal parts of each

10. When they are 1/2 to 1 inch long

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Answer Sheet for Test
on
PROPAGATION FROM CUTTINGS

PART I:

1. T

2. F

3. T

4. F

5. F

PART II:

1. 70-75°

2. a. One which can be kept uniformly moist
   b. Provide good drainage
   c. Aeration

3. When roots are 1/2 to 1 inch long

4. From new growth in spring or early summer

5. Soggy

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Propagation

TOPIC: Propagation by Layering

1. To induce root formation

2. Ivy, philodendrons, blackberries, and strawberries

3. Plants such as crotons, hibiscus, dracaenas, and rubber plants

4. To produce plants which do not produce true from seed, also they may he produced quicker.

5. Knife, toothpick or small piece of wood, growth hormone, spagnum moss, and plastic film or aluminum foil.

6. Spring and summer months when high temperatures and high humidity contribute toward quicker rooting.

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Answer Sheet for Test
on
PROPAGATION BY LAYERING

PART I:

1. F

2. T

3. T

4. T

5. F

PART II:

1. a. Croton
   b. Hibiscus
   c. Dracaenas
   d. Rubber plants

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Propagation

TOPIC: Propagation by Division

1. Primrose Jasmine	Chrysanthemums
Fig Trees	Sansevieria
Iris	Geraniums

2. Dormant season

3. They get too big for their space or they become weakened due to competition.

4. Divide in autumn or early spring when plants are dormant.

5. Divide with a hand fork, knife, or hatchet, if clumps are large. Some can be soaked in water to loosen dirt from around roots. Pull apart and cut old leaves back about one-half and be careful with young growth.

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Assistant Groundskeeper 944-IV-4

Answer Sheet for Test
on
PROPAGATION BY DIVISION

1. T
2. T
3. T
4. F
5. T

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944-IV-5

Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Propagation

TOPIC: Propagation by Grafting and Budding

1. Stock is the name for the plant on which you graft. The scion is the piece of stem which is grafted to the stock and becomes the new plant.

2. It is the soft layer of tissue on a stem or root that lies between the bark and the wood.

3. Any time during the growing season. Usually it is more satisfactory if done before buds begin to swell in late winter or early spring.

4. A sharp knife makes a clean slice, thereby insuring maximum contact of cambium layers.

5. "T" budding and patch-budding

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Answer Sheet for Test
on
PROPAGATION BY GRAFTING AND BUDDING

PART I:

1. Stock is the name for the plant onto which you graft.
2. The cambium layer is the soft layer of tissue on a stem or root that lies between the bark and the wood.
3. "T" budding and patch-budding.

PART II:

1. T
2. T

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Plant Propagation

TOPIC: Propagation from Seed

1. From commercial producers of seeds

2. It must be finely screened, porous, loose, and have a good water-holding capacity. Also it should be sterilized and in most cases low in nutrients.

3. In most cases 70° F

4. The feed will rot

5. 50-60°

6. To reduce damping off

7. a. Name of plant or variety
   b. Date seeded
   c. Student's name
   d. Special treatment, if any

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Answer Sheet for Test
on
PROPAGATION FROM SEEDS

PART I:

1. T

2. F

3. F

PART II:

1. Sphagnum moss

2. Flat 2" x 4" board or brick

3. Sand or other inert material

4. a. Name of plant or variety
   b. Date seeded
   c. Student's name
   d. Special treatment, if any

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944-V-1

Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Nursery Plant Production

TOPIC: Developing a Nursery Vocabulary

1. Aerated - Supplied with air.

2. Alkaline - Above pH 7. Most greenhouse soils should be slightly acid-pH 6.0 to 6.5.

3. Bract - Modified leaf immediately below the flower of some plants, such as the red bracts on poinsettia.

4. Budding - The vegetative reproduction of plants by placing a leaf bud of the desired plant on the root stock of another plant in such a way that the two unite and grow.

5. Callus - The first tissue that forms on the cut end of a cutting or at the union of scion and root stock in a graft.

6. Cold Frame - An outdoor growing area that can be covered with glass or transparent sash.

7. Dormant - Not in an active state of growth.

8. Floret - The individual flower of a flower cluster. The florets may be compactly arranged as in chrysanthemum, or well spaced as in snapdragon.

9. Hormone - Growth substance that influences the growth and development of plants.

10. Humidity - The amount of moisture in the air expressed as the percent of the total amount possible.

11. Internode - The portion of the stem between two nodes.

12. Lath House - An outdoor growing area that is covered with lath spaced to allow penetration of about one half the light.

UNIT: Nursery Plant Production
TOPIC: Developing a Nursery Vocabulary
(Answer Sheet continued)

13. Mylar - a clear, polyester plastic film used as covering for plastic houses.

14. ppm - Parts per million, a common means for expressing the amount of material in a solution or mixture.

15. PVC - (polyvinylchloride) (vinyl) - Either film or rigid plastic for covering plastic houses.

16. Pistil - The female portion of the plant.

17. Propagation - The reproduction of plants by seed, cuttings, budding or grafting.

18. Seedling - A young plant that was produced from seed.

19. Sub-Irrigate - To supply water to the soil from the bottom.

20. Vinyl (polyvinylchloride) (PVC) - Either film or rigid plastic for covering plastic houses.

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Answer Sheet for Test
on
DEVELOPING A NURSERY VOCABULARY

1. Condensation
2. Dormant
3. Fertilizer
4. Germination
5. Leaf axil
6. PVC or Vinyl
7. Seedling
8. Sexual
9. Shoot
10. Stamen

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Nursery Plant Production

TOPIC: Planting Ornamental Trees and Shrubs

1. As soon as they begin to arrive at the nurseries, or in late fall or early winter
2. It should be at least one to two feet wider and at least six inches to a foot deeper than the roots of the plant
3. One-third
4. Balled and burlapped
5. One which is over five inches in diameter

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Answer Sheet for Test
on
PLANTING ORNAMENTAL TREES AND SHRUBS

1. One to two feet wider, six inches to one foot deeper
2. Same level
3. One-third
4. Five inches or over in diameter
5. Balled and burlapped

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

1. If you have no good reason for pruning a plant, put the tools away without using them
2. High quality, sharp, and well adapted to the job on hand
3. At any time
4. Growth habit and blooming characteristics of the plant
5. About one-third
6. To tidy up their appearance, to control size and to improve their health, growth habits and blooms
7. They should be pruned between leaf drop and first spring growth
8. After they flower
9. After they flower
10. A flat-top hedge is more difficult to maintain and clip and is more easily broken down by weather and other causes.

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Answer Sheet for Test
on
PRUNING

PART I:

1. T
2. F
3. T
4. F
5. T

PART II:

1. Growth habit, blooming characteristics
2. Bareroot
3. Leaf drop, first spring growth
4. Thinning out
5. Better shape, fruitful growth

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944-VI-1

Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Floral Crop Production

TOPIC: Introduction to Floral Crop Production

1. Flowers can not be stored for long periods of time.

2. a. Chrysanthemum
   b. Rose
   c. Carnation

3. Directly from the producer

4. "Say it with flowers"

5. Southern Florist and Nurseryman

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Answer Sheet for Test
on
INTRODUCTION TO FLORAL CROP PRODUCTION

1. Carnations
2. Floriculture
3. Light
4. Commission
5. Beltsville

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944-VI-2

Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Floral Crop Production

TOPIC: Growing Annuals

1. Summer

2. Alyssum

3. a. Marigold
   b. Nasturtium
   c. Zinnia

4. Water annuals enough to keep the roots from drying out, but do not "drown" them.

5. Pulled up and thrown away

6. Summer

7. No

8. Fiery red

9. Rock gardens, banks

10. Often subject to wilt

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Answer Sheet for Test
on
GROWING ANNUALS

True or False:

1. True
2. False
3. False
4. True
5. True
6. True
7. True
8. True
9. True
10. False

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Floral Crop Production

TOPIC: Perennials

1. Chrysanthemum

2. Corsages

3. Every two years

4. Cut them back after spring bloom and give them a feeding

5. About every twenty years

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Answer Sheet for Test
on
PERENNIALS

1. Two
2. Loam
3. Chrysanthemum
4. a. Cut
   b. Feeding
5. Fall

944-VI-4

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Floral Crop Production

TOPIC: Bulbs

1. Summer

2. The foliage is needed to restore energy to the bulb.

3. Fungicides and insecticides

4. Short underground stem on solid basal plate, surrounded by fleshy leaves that store food for future growth

5. A creeping underground stem, often thick with stored food

6. No answer required.

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Assistant Groundskeeper 944-VI-4

Answer Sheet for Test
on
BULBS

1. Bulb
2. Rhizome
3. Divide
4. Sun
5. Rot

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

1. Geographic location, the amount of water available for irrigation, the degree of shade present, the time and money the home owner is willing to spend for establishment, and the expected usage.

2. Warm-season and cool-season

3. a. Does not grow in shade
   b. Turns brown after frost in the fall
   c. Is more of a nuisance than other turf grasses

4. a. Is susceptible to certain diseases
   b. Is more susceptible to iron chlorosis
   c. Is attacked by insects
   d. Needs more water for survival
   e. Will not survive at as low temperatures as will Bermuda
   f. Is a broad-leaved course-textured plant

5. a. Is attractive and wear-resistant
   b. Is not invaded by weeds
   c. Is subject to little damage from insects and diseases

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Answer Sheet for Test
on
TURF GRASSES FOR TEXAS

1. F
2. T
3. T
4. T
5. T

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944-VII-2

Answer Sheet
for
ASSISTANT GROUNDSKEEPER

1. Preparation of the soil, establishment of the grass, care and maintenance.

2. Peat, compost, gin trash, sawdust, and leaf mold.

3. Fertilizer applications should be made at rates and in combinations suggested by soil tests.

4. The type of grass used and the rapidity of cover desired.

5. In order to develop a deep root system.

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Answer Sheet for Test
on
ESTABLISHING A NEW TURF

1. F
2. T
3. T
4. T
5. T

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Establishing and Caring for Lawns

TOPIC: Managing an Established Turf

1. Feeding, watering, aerating, and mowing
2. It produces vegetative growth and gives the plant a deep green color.
3. It stimulates development of a good root system.
4. Stunted growth of the entire plant. The leaves are relatively small, thin, and yellowish-green to yellow. They show yellow to brown color at the tip of the leaf and down to the midrib.
5. Slow growth of the entire plant, leaves are an unhealthy dark green, roots are stunted.
6. Pale, bleached leaves
7. Spring and early fall
8. Applying iron sulfate or iron chelate
9. Produce shallow, weak root systems, which does not allow efficient utilization of plant food or moisture in the soil.
10. It allows air or oxygen to get into the soil, water to move into and through the soil, and the soil to hold more water.

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Answer Sheet for Test
on
MANAGING AN ESTABLISHED TURF

PART I:

1. T

2. F

3. T

4. T

5. T

PART II:

1. Feeding, watering, aerating, and mowing

2. Stunted

3. Iron sulfate or iron chelate

4. Soil solids, water and air

5. Loosening

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944-VII-4

Answer Sheet
for
ASSISTANT GROUNDSKEEPER

1. a. Weed
   b. Disease and insect control
   c. Clover in the turf
   d. Renovation of old lawns

2. By proper turf grass management

3. 2-4-D

4. Brown patch occurs as irregularly shaped brown areas, usually circular, 4 to 48 inches in diameter. The fungus gives the grass a blue, water-soaked appearance. As the disease spreads, the dark areas turn light brown.

5. A fungicide containing PCNB

6. a. Chlordane
   b. Dieldrin
   c. D. D. T.
   d. Toxaphene
   e. Malathion
   f. Aldrin
   g. Heptachlor
   h. Lindane

7. When the old turf is run down, weedy, and in a generally undesirable condition, or when a new species is to be introduced.

8. a. Chlordane
   b. Lindane
   c. Sulfur
   d. Toxaphene

9. a. Diazinon
   b. Ethion
   c. Trithion

10. Five gallons of spray mixture per 100 square feet of lawn area

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Answer Sheet for Test
on
TURF PROBLEMS

PART I:

1. T

2. F

3. F

4. T

5. F

PART II:

1. Diazinon, Ethion, Trithion

2. 10-14 days

3. a. Weeds
   b. Diseases
   c. Insects
   d. Clover

4. St. Augustine and bermuda grass

5. PCNB

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Controlling Plant Insects, Plant Diseases, and Other Pests

TOPIC: Causes of Plant Diseases

1. a. Fungi
   b. Bacteria
   c. Viruses
   d. Nematodes

2. The manufacture of sugars from carbon dioxide and water with the aid of sunlight and chlorophyll.

3. An agent that transmits disease producing organisms.

4. Prevention by careful pruning.

5. Tiny, thread-like plants, commonly called molds.

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Answer Sheet for Test
on
CAUSES OF PLANT DISEASES

1. Fungi, Bacteria, Viruses, Nematodes
2. Vector
3. Prevention by careful pruning
4. Host
5. Virus

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Controlling Plant Insects, Plant Disease and Other Pests

TOPIC: Identifying Plant Diseases

1. Proper identification
2. Failure to produce seed or fruit.
3. Liquid discharge from diseased tissues
4. Microscopic examination of roots.

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Answer Sheet for Test
on
IDENTIFYING PLANT DISEASES

1. Identification
2. Scab
3. Canker
4. Gall
5. Nematodes
6. Mummy

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944- VIII- 3

Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Controlling Plant Insects, Plant Diseases and Other Pests

TOPIC: Application and Safety Precautions of Horticultural Chemicals

1. Welfare of the people

2. Welfare of the plant

3. Effectiveness of the material in controlling the pest or disease

4. Hydraulic sprayers

5. Hang the hose on a rack with nozzle pointing upwards

6. a. Read label precautions
   b. Keep chemicals locked up when not in use
   c. Keep children away while using
   d. Don't smoke while spraying
   e. Don't spill material on skin or clothing
   f. Wash exposed areas of skin immediately after job is completed
   g. Never spray when windy
   h. Spray edible plants with great caution

7. The chemical must touch the insect before death occurs.

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Answer Sheet for Test
on
APPLICATION AND SAFETY PRECAUTIONS OF HORTICULTURAL CHEMICALS

1. Hydraulic
2. Contact
3. Read
4. Toxic or poisonous
5. Bomb

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Controlling Plant Insects, Plant Diseases and Other Pests

TOPIC: Controlling Leaf Diseases

1. Water and fertilize properly and remove dead limbs.
2. Caused by fungi which live on secretions from aphids and immature stages of while fly.
3. Caused by excess rain or over watering.
4. a. Malathion
   b. Lindane
5. Just before buds open and after flowering.
6. Two to four weeks or as needed.
7. Most often caused by lack of iron.
8. Fungus disease.

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Answer Sheet for Test
on
CONTROLLING LEAF DISEASES

1. Fungi

2. Iron

3. Rain or Overwatering

4. Malathion and Lindane

5. Watering and Fertilization

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Controlling Plant Insects, Plant Diseases, and Other Pests

TOPIC: Controlling Stem, Branch, and Trunk Diseases

1. Prune infected portions sterilizing shears between each cut.
2. If little dodder is present, remove by hand. Destroy badly infected plants.
3. Reduces the amount of sunlight for trees.
4. Twigs and limbs
5. Fungi
6. Install in the infected parts of tree to drain the excess fluid and relieve pressure.
7. By birds
8. Fungi and algae

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Answer Sheet for Test
on
CONTROLLING STEM, BRANCH, AND TRUNK DISEASES

1. Fungi and algae
2. Pruning
3. Destroyed
4. Slime Flux
5. 50% fixed copper and Bordeaux mixture

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Controlling Plant Insects, Plant Diseases, and Other Pests

TOPIC: Controlling Root Diseases

1. Carbon bisulfide soil fumigation

2. Methyl bromide soil fumigation

3. Removing and destroying diseased roots

4. Ten (10) feet

5. East and Southeast Texas

6. 75-95 degrees

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Assistant Groundskeeper 944-VIII-6

Answer Sheet for Test
on
CONTROLLING ROOT DISEASES

Fill in the blanks:

1. 75° to 95°
2. Methyl bromide
3. Carbon bisulfide
4. Nematodes
5. Sterilize

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Controlling Plant Insects, Plant Diseases and Other Pests

TOPIC: Controlling Diseases Affecting the Entire Plant

1. Symptoms exhibited by aster yellows that are not exhibited by verticillium wilt.
    a. Bushy with numerous secondary shoots
    b. Leaves may develop a slightly reddish, brownish, or purplish tinge in later stages.
    c. Flower parts may develop into leafy structures.

2. DDT

3. Chloropicrin

4. West

5. Commercial growers or trained personnel

6. Miticide

7. Zineb, CM-19

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Answer Sheet for Test
on
CONTROLLING DISEASES AFFECTING THE ENTIRE PLANT

1. DDT

2. Chloropicrin

3. Western

4. Zineb

5. Miticide

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Controlling Plant Insects, Plant Diseases and Other Pests

TOPIC: Controlling Lawn and Turf Diseases

1. Handpick and destroy mushrooms or toadstools.
2. Iron sulfate or iron chelate
3. Irregular-shaped dead areas from a few inches to more than several feet in diameter.
4. Wash off withwater applied as a spray with 20 to 30# pressure.
5. Zineb, Captan
6. One to two weeks before disease usually appears and a second application after disease appears. Then apply as needed.
7. Apply chemicals as needed in early stages of disease.

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Answer Sheet for Test
on
CONTROLLING LAWN AND TURF DISEASES

1. Iron

2. Zineb, Captan

3. Needed

4. Handpick

5. Irregular-shaped

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Controlling Plant Insects, Plant Diseases and Other Pests

TOPIC: Identifying Plant Insects and Methods of Control

1. Slugs have no shells

2. Spring

3. Spray before eggs hatch and prune

4. Roots

5. Sandy soils

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Answer Sheet for Test
on
IDENTIFYING PLANT INSECTS AND METHODS OF CONTROL

Fill in the blanks:

1. Roots
2. Pillbug
3. Nematodes
4. Caterpillars
5. Plant lice
6. Scales

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944-XIII-10

Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Controlling Plant Insects, Plant Diseases and Other Pests

TOPIC: Nematodes

1. a. Select a plant that is partly alive.
   b. Dig the plant instead of pulling it.
   c. Wash the soil from the roots and allow a few minutes for drying.
   d. Place the specimen in a polyethylene container and tie it securely.
   e. Fill out form D-418, available from your county extension agent.
   f. Place bag and D-418 in a box and send it to the research center.

2. Root knot nematode

3. Before spending a large amount of money for chemicals, determine if nematodes are causing a significant amount of damage to justify the expense and labor.

4. a. Crown gall
   b. Nodules from nitrogen fixation

5. Tomato, okra

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Answer Sheet for Test
on
NEMATODES

Fill in the blanks:

1. Knot root

2. Okra

3. a. Expense
   b. Labor

4. Crown galls

5. Fertilizer

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Controlling Plant Insects, Plant Diseases, and Other Pests

TOPIC: Control of Moles, Gophers, Birds, and Deer

1. By conical mounds of dirt pushed up from their main run

2. Baiting and trapping

3. Serious injury might occur to small children or dogs

4. Gophers open their tunnels; moles do not.

5. Place chicken wire at the bottom and sides of planting holes.

6. Starlings

7. Portable bird protectors made of scrap lumber, chicken wire or cheesecloth.

8. Fencing

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Answer Sheet for Test
on
CONTROL OF MOLES, GOPHERS, BIRDS, AND DEER

1. Mole
2. Baiting
   Trapping
3. Starling
4. Fencing
5. Closed

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Controlling Plant Insects, Plant Diseases and Other Pests

TOPIC: Controlling Weeds

1. Water should be applied.

2. Hoe

3. Ice pick or screwdriver

4. Shrubs form a shade in which weeds do not thrive.

5. Apply organic mulch two to three inches deep.

6. Wear gloves.

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Assistant Groundskeeper 944-VIII-12

Answer Sheet for Test
on
CONTROLLING WEEDS

1. Gloves

2. Hoe

3. Sunlight

4. Chemical

5. Water

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Operating and Maintaining Horticultural Equipment

TOPIC: Principles Used to Prevent Personal Injury

1. Legs
2. One pulley only changes direction of force
3. Jack
4. Wet the soil 4 to 5 days before digging
5. Hook a 1/2" pipe onto a hose and beat the bottom end into a flattened or pointed opening. This will enable you to stick the pipe down into the hole where the force of the water through the small opening will loosen the soil.

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Answer Sheet for Test
on
PRINCIPLES USED TO PREVENT PERSONAL INJURY

1. Legs
2. Changes
3. Blasting
4. Moisture, insects
5. Pulley

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Operating and Maintaining Horticultural Equipment

TOPIC: Selection and Maintenance of Horticultural Hand Tools

1. Tools are very personal pieces of equipment and all experienced gardners have their favorites.
2. Scoop
3. 6"
4. Sharpen the hoe each time you take it into the garden.
5. Scuffle hoe
6. a. Fan-shaped
   b. Rectangular

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Answer Sheet for Test
on
SELECTION AND MAINTENANCE OF HORTICULTURAL HAND TOOLS

1. Scoop
2. Level
3. Fan-shaped and rectangular
4. 6"
5. Metal bow

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Operating and Maintaining Horticultural Equipment

TOPIC: Maintaining Small Power Equipment

1. a. Periodic equipment inspection to discover situations which may lead to equipment breakdown
   b. Upkeep to minimize wear or to remedy potential trouble

2. Make an overall check and properly service equipment.

3. Water condenses more rapidly in a partially filled tank.

4. Gasoline or other solvents

5. Tension and wear

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Assistant Groundskeeper 944-IX-3

Answer Sheet for Test
on
MAINTAINING SMALL POWER EQUIPMENT

1. Tension, wear
2. Operator
3. Grease, oil
4. Gasoline
5. Preventive

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944-IX-4

Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Operating and Maintaining Horticultural Equipment

TOPIC: Operating and Maintaining Lawn Mowers Safely and Effectively

1. a. Reel
   b. Rotary
   c. Sickle bar

2. Mowing too close

3. Disconnect the spark plug wire so that a spark can not jump.

4. Cutter bar and knife

5. The clippings will smother the grass.

6. Leaves produce food for the plant. If leaves are cut too short, the health and vigor of the lawn will be greatly reduced.

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Answer Sheet for Test
on
OPERATING AND MAINTAINING LAWN MOWERS SAFELY AND EFFECTIVELY

1. a. Reel
   b. Rotary
   c. Sickle bar

2. Scalping

3. Cutter bar and knife

4. Leaves

5. Smothers the grass

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Operating and Maintaining Horticultural Equipment

TOPIC: Operating and Maintaining Rotary Tillers Safely and Effectively

1. a. Front tine
   b. Rear tine

2. Front tine

3. Rotation of the tine

4. Raise the depth bar

5. Check to make sure that all clutches and belt tension pulleys are disengaged.

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Answer Sheet for Test
on
OPERATING ROTARY TILLERS SAFELY AND EFFECTIVELY

1. Tine
2. Power
3. Depth bar
4. Rear tine
5. Disengaged

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944-IX-6

Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Operating and Maintaining Horticultural Equipment

TOPIC: Operating Garden Tractors Safely and Effectively

1. The tractor must have enough horsepower to operate the power sickle bar.
2. 3 1/2 - 10 horsepower
3. Below the rear axle level
4. Riding lawn mowers are designed only for mowing. Small tractors are designed for several types of attachments.
5. a. Automotive
   b. Belt type

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Answer Sheet for Test
on
OPERATING GARDEN TRACTORS SAFELY AND EFFECTIVELY

1. 3 1/2 - 10
2. Belt, automotive
3. Jackshaft
4. Rubber tires

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Developing and Maintaining the Landscape

TOPIC: Introduction to Home Landscaping

1. a. Art
   b. Engineering
   c. Horticulture

2. a. Homeowners who purchase subdivision or housing development homes.
   b. Families who buy new homes already designed and constructed, with no specific client in mind.
   c. Families who purchase a lot, have their home especially planned and constructed for them on the lot.
   d. Families who now live in older homes and desire to remodel or redesign their gardens.

3. They do not fit into our mechanized way of living.

4. Climate varies

5. The cost is included in the price of plants.

1949

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Answer Sheet for Test on INTRODUCTION TO HOME LANDSCAPING

1. Mechanized
2. Balanced
3. Plants
4. Garden
5. Space

1947

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944-X-2

Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Developing and Maintaining the Landscape

TOPIC: Selecting the Site

1. General location

2. Zoning prevents businesses from moving into a residential section.

3. No

4. a. Privacy is difficult
   b. Require installation of additional utilities, walks, and drives
   c. Outdoor space is limited
   d. More noise from traffic

5. a. Drives and sidewalks are too deep
   b. Lawn is more difficult to keep

6. South. Sunlight can be better controlled

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Assistant Groundskeeper 944-X-2

Answer Sheet for Test
on
SELECTING A SITE

1. General location
2. Zoning
3. Homeowner
4. Corner
5. Drainage

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Developing and Maintaining the Landscape

TOPIC: Scheduling Landscape Development and Beginning Plans

1. A well-planned garden is one that is livable, interesting, beautiful, easy to maintain, and where relationships between outdoor and indoor areas are coordinated properly.

2. Drives and walks

3. Trees are essential for shade in Texas.

4. Provide privacy and assist in temperature control

5. a. There must be a program for site and landscape development.
   b. There must be a plan.

6. A piece of real estate which may be merely a lot or one with a home on it.

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Assistant Groundskeeper 944-X-3

Answer Sheet for Test
on
SCHEDULING LANDSCAPE DEVELOPMENT AND BEGINNING PLANS

1. Walks, drives
2. Trees
3. Privacy, temperature
4. Expense
5. Site

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Developing and Maintaining the Landscape

TOPIC: Analyzing Problems and Determining Needs

1. a. Suitability
   b. Function
   c. Economy
   d. Beauty

2. Deciding and analyzing specific problems of a chosen site.

3. a. Do you prefer them to be beautiful and pleasant?
   b. Do you want them to make you feel comfortable?
   c. Do you care whether they fit together well and serve their purpose?
4. a. Space
   b. Garden development
   c. Maintenance

5. a. Individual taste
   b. Past environment

6. No. It is even hard for professionals.

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Answer Sheet for Test
on
ANALYZING PROBLEMS AND DETERMINING NEEDS

1. Beauty

2. Site

3. a. Suitability
   b. Function
   c. Economy
   d. Beauty

4. Mass, color, texture

5. Property

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Developing and Maintaining the Landscape

TOPIC: Developing the Landscape Plan

1. Before the property is purchased

2. 1 inch equals 10 feet

3. a. Entrance
   b. General living area
   c. Work space
   d. Place for private living

4. General living area

5. Bedroom area

6. a. Formal
   b. Informal

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Assistant Groundskeeper 944-X-5

Answer Sheet for Test
on
DEVELOPING THE LANDSCAPE PLAN

1. a. Access to property
   b. General living area
   c. Work space
   d. Place for private living

2. a. East Texas
   b. Costal Plains
   c. Central Texas
   d. Texas Plains
   e. Southwest Texas
   f. Western Texas

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Developing and Maintaining the Landscape

TOPIC: Selecting Plants

1. 12, 25 feet

2. 6-8 feet

3. Dwarf shrubs

4. The roots may clog drain pipes.

5. Broadleaf evergreen

6. a. Watering
   b. Mowing
   c. Edging
   d. Clipping
   e. Weeding
   f. Fertilizing
   g. Controlling insects

7. a. Privets
   b. Arborvitae

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Assistant Groundskeeper 944-X-6

Answer Sheet for Test
on
SELECTING PLANTS

1. Annual, perennial
2. Watering
3. Australia
4. 12, 25
5. Medium

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Developing and Maintaining the Landscape

TOPIC: Grading, Drainage, and Landscape Structures

1. Using splash blocks
2. No
3. Building a wall around it and leaving the grade unchanged in the immediate area
4. Making them too narrow
5. 4 feet

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Answer Sheet for Test
on
GRADING, DRAINAGE, AND LANDSCAPE STRUCTURES

1. False

2. False

3. True

4. False

5. True

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Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Developing and Maintaining the Landscape

TOPIC: Winter Protection Structures

1. You should notice where the frost will do the most damage by checking the pattern of nipping.

2. Damp soil holds and releases more heat than dry soil.

3. Allows sun to penetrate soil in daytime and traps this heat.

4. Every side of a tree should "see" a heater.

5. a. Trees are still (no wind)
   b. Stars out
   c. Temperature around 45 degrees
   d. Dry windshields or windows

Assistant Groundskeeper 944-X-8

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Answer Sheet for Test
on
WINTER PROTECTION STRUCTURES

1. Hillside
2. North
3. Damp
4. Damp, dry
5. Cloches

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944-X-9

Answer Sheet
for
ASSISTANT GROUNDSKEEPER

UNIT: Developing and Maintaining the Landscape

TOPIC: Structures for Summer Heat Protection

1. a. Protect foliage
   b. Keep roots cool
   c. Consume moisture

2. East

3. Cheesecloth, saran

4. North and South

5. Nail each lath to a diagonal brace beneath.

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Assistant Groundskeeper 944-X-9

Answer Sheet for Test
on
STRUCTURES FOR SUMMER HEAT PROTECTION

1. North, south
2. Shade
3. 10
4. Shade
5. East

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940-I-1

Topic Test
on
HORTICULTURE AS AN INDUSTRY

Student: ____________________ School: ____________________

Date: ____________________ Score: ____________________

Place a check under T for True or under F for False:

T F

____ ____ 1. Pomology is the science of producing cut flowers.

____ ____ 2. Olericulturists are concerned with vegetables.

____ ____ 3. The annual production of vegetables exceeds one billion dollars.

____ ____ 4. Apples are classed as small fruits.

____ ____ 5. Cotton is a horticultural crop.

____ ____ 6. Grapes are classed as citrus fruits.

____ ____ 7. Floriculture has developed in the past ten years.

____ ____ 8. Out-of-season production of vegetables is an important industry in the West and South.

____ ____ 9. Ornamental plants are considered as horticultural plants.

____ ____ 10. Olericulturists are not concerned with marketing vegetables. They deal only with production.

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Topic Test
on
EXPLORING OCCUPATIONAL OPPORTUNITIES

1. List at least 10 factors, in your own words, which one should consider in selecting an occupation.
   a. ______________________________
   b. ______________________________
   c. ______________________________
   d. ______________________________
   e. ______________________________
   f. ______________________________
   g. ______________________________
   h. ______________________________
   i. ______________________________
   j. ______________________________

2. List the five job titles for which descriptions were provided in the assignment.
   a. ______________
   b. ______________
   c. ______________
   d. ______________
   e. ______________

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Assistant Groundskeeper 944-II-1

Topic Test
on
ORIGIN, COMPOSITION, AND IMPORTANCE OF SOILS

Student: ______________________ School: ______________________

Date: ______________________ Score: ______________________

PART I: Fill in the blanks:

1. The largest of the soil particles is ____________.
2. Decayed plants and animal material is called ____________.
3. ____________ and ____________ determine the rate of soil formation.
4. Clay feels like __________ when rubbed between the fingers.
5. The difference in texture of soils is caused by the different sizes of soil ____________.

PART II: List:

1. Three (3) layers of soil from top to bottom:
    a. ____________________
    b. ____________________
    c. ____________________
2. Three (3) factors that are responsible for differences in soil color:
    a. ____
    b. ____
    c. ____

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Assistant Groundskeeper 944-II-2

Topic Test
on
SOIL MOISTURE

Student: ______________________ School: ______________________

Date: ______________________ Score: ______________________

PART I: Fill in the blanks:

1. Moisture moves through the soil in all directions even against gravity by ______________ movement.
2. In __________ textured soils, the particles are closer together and the attraction between soil and water is greater.
3. Much soil moisture can be lost when capillary water moves to the surface and ______________.
4. All living cells carry on ______________.
5. Movement of air through the soil is called ______________.

PART II: Check T for true and F for false:

T	F		
____	____	1.	Soils should be worked while in a wet condition.
____	____	2.	It is possible to change water-holding capacity of soil.
____	____	3.	Underwatering causes decreased aeration.
____	____	4.	Sandy soils require more frequent watering than heavy clay soils.
____	____	5.	Oxygen must be present for respiration to occur.

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Topic Test
on
SOIL MIXTURES

Fill in the blanks:

1. __________ soils are a mixture of sand, silt, and clay.

2. ________________________ increases aeration of soil.

3. Loam soils become ____________ after watering.

4. For large scale mixing operations, use a power driven cement mixer or ________________.

5. Loam soils often ____________ after drying.

List:

6. The characteristics of a good mixture:

a. ______________________________________.

b. ______________________________________.

c. ______________________________________.

d. ______________________________________.

e. ______________________________________.

f. ______________________________________.

g. ______________________________________.

h. ______________________________________.

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Assistant Groundskeeper 944-II-4

Topic Test
on
MULCHES

Student: ______________________ School: ______________________

Date: ______________________ Score: ______________________

PART I: Fill in the blanks:

1. The most common mulch is ______________.

2. The time to apply mulch to the garden on established plants is in ______________________.

3. Additional ______________ should be applied to a crushed corncob mulch.

4. ____________ may be produced during decomposition of lawn clippings.

5. A light spray of ____________ may be used by contractors to hold soil in place on steep slopes.

PART II: Multiple choice:

_____ 1. The cost of this material is usually prohibited when large areas are mulched.
a. crushed corncob b. peat moss c. wood chips

_____ 2. This material should not be used in areas where a cigarette may be dropped.
a. corncobs b. asphalt c. straw

_____ 3. Any mulch should be at least this deep:
a. 1/4" - 1/2" b. 1" - 2" c. 2" - 3"

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Topic Test
on
FERTILIZER NUTRIENTS

Student:____________________ School:____________________

Date:____________________ Score:____________________

Fill in the blanks:

1. _______________ is responsible for the dark green color in plants.
2. The two lime elements are _______________ and magnesium.
3. Do not apply dry fertilizer to plants when the foilage is _____.
4. Place fertilizer _______________ and to the side of the seed.
5. Dry fertilizer can be _______________ (how applied) over the soil surface by means of a spreader.

List:

1. Three primary elements
   a. _______________
   b. _______________
   c. _______________
2. Three secondary elements
   a. _______________
   b. _______________
   c. _______________

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Topic Test
on
SOIL ORGANISMS

Fill in the blanks:

1. ________________ convert nitrogen in the air to available plant nitrogen.

2. Moisture, lime, and _____________ can be added to the soil to stimulate soil organisms.

3. _________________________ feed on soil bacteria and contribute to organic content of the soil.

4. ____________________ decompose organic residues and promote the formation of humus.

5. The _______________ mixes soil and increases aeration. Also it promotes drainage.

List:

6. Three ways to control harmful soil organisms.
   a. ____.
   b. ____.
   c. ____.

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Assistant Groundskeeper 944-III-7

Topic Test
on
SOIL STERILIZATION

PART I: Fill in the blanks:

1. ___________ sterilization is cheaper than using chemicals.

2. Ethylene di-bromide is especially effective against ____________.

3. No plants should be planted into a fumigant-treated soil for a period of______to_____weeks.

4. Ammonia build-up in the soil may cause ______________.

5. Nematodes are killed__________when exposed to 140° F. steam heat.

PART II: List:

1. Reasons for sterilizing soils.
   a. ____
   b. ____
   c. ____
   d. ____

2. Three precautions to observe when using fumigants:
   a. ____
   b. ____
   c. ____

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Topic Test
on
PLANT GROWING MEDIA OTHER THAN SOIL

Student:________________________ School:________________________

Date:________________________ Score:________________________

Fill in the blanks:

1. __________ is the most widely used medium for reproduction of plants.

2. Sphagnum will retain_____to_____times its own weight in water.

3. __________________expands or explodes when heated.

4. Shredded bark, sawdust, and wood shavings are most commonly used in the________________part of the United States.

5. When sawdust is used,____________must be added to the medium.

6. Brown to black peat contains approximately 1%________________.

7. ______________results from decayed remains of thick vegetation in swampy condition.

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Topic Test
on
INTRODUCTION

Student:______________________________ School:__________________________

Date:_________________________________ Score:__________________________

Fill in the blank:

1. _______________ is the study of plants.

2. There are over ______________ kinds of plants found in the world.

3. _________________ and _________________ are carbohydrates.

4. Van Helmont did an experiment to determine what made plants grow. His conclusion was that _______________ alone produced growth.

5. Plants differ from animals in that they produce food from _________________ and ___________________.

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Topic Test
on
PHOTOSYNTHESIS

Student:____________________ School:____________________

Date:____________________ Score:____________________

Fill in the blank:

1. ______________ is the process by which liquids and gases move from an area of high concentration to an area of low concentration.

2. ____________ means light.

3. All substances are made up of ______________.

4. Photosynthesis requires four components. They are ______________, ______________, ______________, and ______________.

5. When atoms are combined, we call them a ______________.

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Topic Test
on
RESPIRATION

Student:______________________________School:______________________________

Date:________________________________Score:______________________________

Fill in the blank:

1. Raw materials for respiration are ________________and________________.
2. Energy is ______________during photosynthesis.
3. Respiration ______________dry weight. (increases or decreases)
4. Plants release ______________at night. (what gas?)
5. ________________is the release of chemical energy.

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Assistant Groundskeeper 944-III-4

Topic Test
on
WATER ABSORPTION AND LOSS--NUTRIENT ABSORPTION--MOVEMENT OF WATER AND NUTRIENTS IN THE PLANT

Student:________________________ School:________________________

Date:________________________ Score:________________________

Fill in the blanks:

1. ____________ are elements, or groups of these elements, needed for plant growth.
2. Each vascular bundle has two types of conductive tissue called the ________ and ____________.
3. ____________ occurs from plant injuries.
4. ____________ is the loss of water from the plant as a vapor.
5. The principal water-absorbing structure is the __________ __________.

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Topic Test
on
PLANT FOOD

Student:____________________________School:__________________________

Date:______________________________Score:__________________________

Fill in the blank:

1. Examples of the carbohydrates include the sugars, starches, and _______________.

2. A pound of ______________has about 2 1/4 times as much stored energy as a poung of sugar.

3. _______________is the principal part of lean meat.

4. _______________,_______________,______________, and __________________ make up about 97% of the dry weight of most plants.

5. The "____________________elements" are those which the plant must have in order to survive.

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Topic Test
on
THE PLANT KINGDOM

Student:______________________________School:________________________

Date:________________________________Score:_________________________

Fill in the blanks:

1. ____________plants cause many diseases of higher plants by attacking, multiplying, and living in or on the higher plants.

2. The botanist classifies the seed-producing plants according to their ___________ ___________.

3. Helpful soil organisms and the nitrogen-fixing organisms found in legume nodules are examples of ______________bacteria.

4. ____________forms a green scum on ponds and live in both fresh water and sea water.

5. The plant world has been divided into ____________divisions.

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Topic Test
on
INTRODUCTION TO PROPAGATION

PART I: Fill in the blanks:

1. Two methods by which plants may be propagated are ______________, and ____________________.

2. Three requirements of the ideal plant propagation structure are ________________, ________________, __________ and ________________.

3. __________________ is used for chemical sterilization of soil.

4. A good propagation media should be free of ______________, ______________, and ________________.

5. Many types of containers are used in plant propagation such as ________________, ____________________, and ________________.

PART II: Place a check under T for true or under F for false for each of the following statements:

T F

__ __ 1. If soil is used, sterilization is a must.

__ __ 2. Many plant propagators use a plant hormone to promote rooting of seeds.

__ __ 3. Seed reproduction in plants is basically a sexual process.

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Topic Test
on
PROPAGATION FROM CUTTINGS

PART I: Place a check under T for true or under F for false for each of the following statements:

T	F	
___	___	1. Many types and varieties of plants will not produce the same quality and type of plant from seed and must be reproduced by cutting, budding, or grafting.
___	___	2. Cuttings are more difficult to make than budding.
___	___	3. Cuttings are classified and named according to the part of the plant from which they come.
___	___	4. Herbaceous cuttings are made from plant materials which are hard.
___	___	5. Low humidity is necessary for rooting cuttings.

PART II: Fill in the following blanks to make complete true statements.

1. The temperature of the rooting medium should be close to __________.

2. Three requirements of a good rooting medium are:

   a. ____.

   b. ____.

   c. ____.

3. Cuttings are ready to transplant when roots are ____________________.

4. Softwood cuttings are made (when) ______________________________.

5. During rooting the medium must be kept uniformly moist but never __________.

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Topic Test
for
PROPAGATION BY LAYERING

PART I: Place a check under T for true and under F for false for each of the following statements:

T F

___ ___ 1. The production of a new plant by layering is one of the slowest methods.

___ ___ 2. Air layering is an excellent way to produce plants which do not come true from seed.

___ ___ 3. Air layering is best practiced during the spring and summer months.

___ ___ 4. A growth hormone may help to stimulate root growth.

___ ___ 5. Under ideal conditions, plants should root in a few months when they are air-layered.

PART II: List:

1. List four plants which can be air-layered.

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Assistant Groundskeeper 944-IV-4

Topic Test
on
PROPAGATION BY DIVISION

Student: ____________________ School: ____________________

Date: ____________________ Score: ____________________

T F

____ ____ 1. Plants are best divided after their season of blossoming.

____ ____ 2. Larger shrubs should be divided when they are dormant for best results.

____ ____ 3. Each root segment or division is actually a plant in itself or is capable of becoming a new plant.

____ ____ 4. Division is a slow way of increasing your supply of perennials.

____ ____ 5. Deciduous and semi-deciduous perennials may be cut back to about four inches from the ground when you transplant.

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Assistant Groundskeeper 944-IV-5

Topic Test
on
PROPAGATION BY GRAFTING AND BUDDING

Student: ______________________ School: ______________________

Date: ______________________ Score: ______________________

PART I: Answer the following questions:

1. Define stock.
2. What is the cambium layer?
3. List two kinds of budding.

PART II: Place a check under T for true or under F for false for each of the following statements:

T F

___ ___ 1. In all grafting methods, the tight union between stock and scion must be sealed off from air with some kind of sealing agent.

___ ___ 2. Evergreens can be grafted in early spring, just before plants begin to grow actively.

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Topic Test
on
PROPAGATION FROM SEEDS

Student: ____________________ School: ____________________

Date: ____________________ Score: ____________________

PART I: Place a check under T for true or under F for false for each of the following statements:

T F

___ ___ 1. There are no bargains when obtaining good seeds.

___ ___ 2. A good growing media for germinating seeds should be high in the nutrients necessary for plant growth.

___ ___ 3. The minimum temperature for seed germination is 70° F.

PART II: Fill in the following blanks to make complete true statements:

1. Some propagators use a layer of a sterile moisture holding material as ______________.

2. A ________________ can be used for firming the top of the soil.

3. To help distribute small seed, mix them with a small amount of ____________________________.

4. The label on a seeded flat should contain

a.

b.

c.

d.

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Topic Test
on
DEVELOPING A NURSERY VOCABULARY

Fill in the blanks with the words provided:

1. ______________ is the process by which water forms on cool surfaces.
2. ______________ means not in an active state of growth.
3. A ______________ is a substance that furnishes chemicals that are necessary for good plant growth.
4. First start of growth in seeds is called ______________.
5. The point where the leaf attaches to the stem is called the ______________.
6. ______________ is film or rigid plastic for covering plastic houses.
7. A ______________ is a young plant that was produced from seed.
8. ______________ propagation is the reproduction of plants by seed.
9. A ______________ is a young stem just starting in growth.
10. The ______________ is the male portion of the plant.

Words to choose from:

1. PVC
2. pH
3. Condensation
4. Dormant
5. Sexual
6. Germination
7. Fertilizer
8. Leaf Axil
9. Organic matter
10. Seedling
11. Shoot
12. Stamen
13. Pistil
14. Asexual
15. Union

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Topic Test
on
PLANTING ORNAMENTAL TREES AND SHRUBS

Fill in the blanks:

1. The hole which the plants are to be set should be ____________ wider and ____________ deeper than the roots of the plant.
2. The plant should be set at the ____________ at which it was growing.
3. When planting a bareroot shrub or tree, ____________ of the top should be pruned.
4. Trees ________________________ usually need guy wires.
5. The nursery term B&B means ____________ and ____________.

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Topic Test
on
PRUNING

PART I: Place a T for True or an F for False in the blank beside each statement:

T F

____ ____ 1. Trees may be pruned at any time.

____ ____ 2. Climbing hybrid-tea roses look best when old blooms are cut off just above the second bud in the axil of a leaf.

____ ____ 3. Many shrubs should be pruned by thinning out rather than by severe pruning.

____ ____ 4. Shrubs which bloom in the spring should be pruned in the fall.

____ ____ 5. Climbing roses should be pruned after flowering.

PART II: Answer the following to make true complete statements:

1. Pruning ornamental shrubs and small flowering trees depends on the ____________ and ____________ of the plant.

2. When woody plants are dug without a ball of soil around the roots, they are said to be dug ____________.

3. Deciduous plants should be pruned between ____________ and ____________.

4. Many shrubs should be pruned by ____________ rather than by severe pruning.

5. Pruning of plants is the cutting off or cutting back of parts of that plant for ____________ or more ____________.

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Assistant Groundskeeper 944-VI-1

Topic Test
on
INTRODUCTION TO FLORAL CROP PRODUCTION

Student: ______________________ School: ____________________

Date: ______________________ Score: ____________________

Fill in the blanks:

1. The three most widely grown cut flowers are roses, chrysanthemums, and ____________________.
2. The cultivation and selling of flowers is known as ____________________.
3. Many greenhouses have been located in a particular area because of the great amount of __________ during the winter or the mild climate.
4. Most cut flowers are sold to the retail flower shops through wholesale ____________________ houses.
5. The U.S.D.A. does research in many phases of floriculture at ____________________, Maryland.

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Assistant Groundskeeper 944-VI-2

Topic Test
on
GROWING ANNUALS

Student: ______________________ School: ______________________

Date: ______________________ Score: ______________________

True or False:

_______ 1. Annuals grow only one year or less.

_______ 2. Morning glories bloom only in the winter.

_______ 3. Asters are resistant to wilt.

_______ 4. There are many varieties of zinnias.

_______ 5. Some annuals take only six weeks from seed to flower.

_______ 6. Annuals can be produced in flats.

_______ 7. Pansies are biennials.

_______ 8. Asters make good cut flowers.

_______ 9. Annuals do best in well prepared soil.

_______ 10. Hollyhocks are blue in color.

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Assistant Groundskeeper 944-VI-3

Topic Test
on
PERENNIALS

Student: ____________________ School: ____________________

Date: ____________________ Score: ____________________

Fill in the blanks:

1. Primrose clumps need dividing every __________ years, after bloom season.
2. Primroses like most soils, but rich ______ is ideal.
3. The ____________ is probably the best perennial for beginning gardeners.
4. Polyantha primroses will repeat bloom in fall if you _______ them back after spring bloom and give them a __________.
5. ________ is a favorite season for dividing and replanting as well as for planting newly purchased perennials.

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Topic Test
on
BULBS

Student:	____________________	School:	____________________
Date:	____________________	Score:	____________________

Fill in the blanks:

1. The term ________ is one that is loosely applied to any plant that has a swollen or thickened basal portion.

2. A __________________ is a creeping underground stem, often thick with stored food.

3. Bublets grow larger each year until it is time to ______________ and replant them.

4. In early spring, cool air and higher humidity enables young plants to tolerate more __________________.

5. In mild-winter regions, tulips will ________ if not dug.

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Topic Test
on
TURF GRASSES FOR TEXAS

Place a check under T for true or under F for false for each of the following statements:

T F

___ ___ 1. Many of the 550 species of grass in Texas are suitable for turf.

___ ___ 2. Bermuda is the turf grass most widely adapted in Texas.

___ ___ 3. St. Augustine is not as cold hardy as Bermuda.

___ ___ 4. St. Augustine is susceptible to certain diseases, notably brown patch and leaf spot.

___ ___ 5. St. Augustine will not live in low, wet areas.

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Topic Test
on
ESTABLISHING A NEW TURF

Place a check under T for true or under F for false for each of the following statements:

T F

___ ___ 1. In all instances, the character of the soil needs to be altered considerable.

___ ___ 2. Terraces should be avoided if possible because of the difficulty of establishing and maintaining turf on terraces.

___ ___ 3. A complete fertilizer should be plowed or spaded under to supply the plant nutrients needed for deep root development.

___ ___ 4. Low-priced seed often are the most costly.

___ ___ 5. Sprigging or sodding must be used for establishing grasses which cannot be propagated by seed.

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Topic Test
on
MANAGING AN ESTABLISHED TURF

PART I: Place a check under T for true or under F for false for each of the following statements:

T F

___ ___ 1. Nitrogen is the key element in turf production.

___ ___ 2. Potassium deficiency causes the leaves to be an unhealthy dark green.

___ ___ 3. Iron chlorosis occurs on soils high in lime.

___ ___ 4. The root system develops during the fall and early spring.

___ ___ 5. Mowing too close encourages thinning of the turf.

PART II: Fill in the following blanks:

1. Four major factors in maintaining a turf are __________, __________, __________, and __________.

2. Calcium deficiency causes __________ growth.

3. Chlorosis may be corrected by applying __________ or __________.

4. A soil in good physical condition for plant growth is a mixture of __________, __________, and __________.

5. Aerifying the soil is a means of __________ the soil.

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Assistant Groundskeeper 944-VII-4

Topic Test
on
TURF PROBLEMS

PART I: Place a check under T for true or under F for false for each of the following statements:

T F

____ ____ 1. Proper turf grass management is the best means of controlling weeds.

____ ____ 2. Brown patch is a fungus disease that attacks only St. Augustine grass.

____ ____ 3. Fungicides which contain PCNB are terraclor and captan.

____ ____ 4. If clovers are not removed from the lawn, they should be kept under control by frequent mowing.

____ ____ 5. Dusts generally are more effective in the control of chiggers than are sprays.

PART II: Fill in the following blanks:

1. Three good sprays for the chinch bug are ______________, ______________, and ________________.

2. Two applications __________ days apart may be necessary for most effective control of bermuda grass mites.

3. Four problems which occasionally arise in the production of a turf are ________, ____________, _________________, and ____________________.

4. Brown patch is a fungus disease that often attacks ____________________ and __________________.

5. Brown patch may be controlled by spraying the affected and immediate surrounding areas thoroughly with a fungicide containing______________.

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Topic Test
on
CAUSES OF PLANT DISEASES

Student:______________________________ School:______________________________

Date:______________________________ Score:______________________________

Fill in the blanks:

1. The four most important causes of plant disease are _______________, _______________, _______________, and _______________.
2. An agent that transmits disease producing organisms is called a __________________.
3. ____ is the best approach to controlling canker disease.
4. A___________is a plant on (in) which a parasite lives and obtains its food.
5. The smallest form of a plant disease is the __________________.

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Topic Test
on
IDENTIFYING PLANT DISEASES

Student:____________________________School:____________________________

Date:______________________________Score:____________________________

Fill in the blanks:

1. The key to disease control is proper________________________.
2. ______________is a rust-like disease lesion; a disease in which scab is a prominent symptom.
3. A____________is an open wound or dead spot, often sunken, in a stem or branch surrounded byliving tissue.
4. A____________is an outgrowth, often more or less spherical, of organized cells.
5. Knots on roots usually indicate that____________________are present.
6. A______________is a dried, shriveled fruit, caused by certain fungus diseases.

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Assistant Groundskeeper 944-VIII-3

Topic Test
on
APPLICATION AND SAFETY PRECAUTIONS OF HORTICULTURAL CHEMICALS

Student: ____________________ School: ____________________

Date: ____________________ Score: ____________________

Fill in the blanks:

1. A ____________ sprayer is one of the most common means of applying pest or disease control materials in the greenhouse.
2. Some chemicals kill only on ____________, therefore the entire plant should be covered.
3. Always ____________ the label before using a chemical.
4. Many of the control materials are ____________ to human beings and they must be used in such a way that they do not endanger anyone.
5. For an aerosol application the pesticides are purchased in a ready to use container commonly called a ________________.

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Topic Test
on
CONTROLLING LEAF DISEASES

Student:______________________________School:__________________________

Date:______________________________Score:__________________________

Fill in the blanks:

1. ____________live on secretions from aphids and immature stages of the white fly and cause sooty mold.

2 Lack of ___________causes chlorosis.

3. Oedema is caused by excess __________or____________________.

4. _________________and_________________are two chemicals good for treating mosaic or leaf curl

5 Proper________________and_______________are the best treatments for scorch and scald.

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Topic Test
on
CONTROLLING STEM, BRANCH, AND TRUNK DISEASES

Student: ____________________ School: ____________________

Date: ____________________ Score: ____________________

1. __________ and __________ cause lichens.
2. Plants that have gall are treated by ______________.
3. Plants badly infected by dodder should be ______________.
4. Plants that have ______________ are treated by installing tubes in the infected parts of the tree to drain excess fluids and relieve pressure.
5. Two chemicals used to control green scruf are ______________ and ______________.

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Topic Test
on
CONTROLLING ROOT DISEASES

Student: ______________________ School: ______________________

Date: ______________________ Score: ______________________

Fill in the blanks:

1. A soil temperature of _____ to _____ degrees is necessary for development of southern blight.

2. ____________________ soil fumigation is an effective treatment for crown gall and hairy rot.

3. Mushroom root rot can be effectively controlled by fumigation with ____________________.

4. Root knot is caused by _______________.

5. Always _______________ the soil where damping-off and seedling blight are a problem.

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Topic Test
on
CONTROLLING DISEASES AFFECTING THE ENTIRE PLANT

Student:______________________________ School:______________________________

Date ______________________________ Score:______________________________

Fill in the blanks:

1. ______________ is an effective treatment for aster yellows.
2. __________________ can be used to control verticillium wilt.
3. The __________________ part of Texas is affected mostly by verticillium wilt.
4. __________________ and CM-19 are both effective controls for botrytis blight.
5. The general name for a chemical used to combat mites is a __________________.

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Assistant Groundskeeper 944-VIII-8

Topic Test
on
CONTROLLING LAWN AND TURF DISEASES

Student:______________________________ School:______________________________

Date:______________________________ Score:______________________________

Fill in the blanks:

1. Lack of______________causes chlorosis.

2. ____________________and________________are controls for Piricularia leaf spot.

3. For control of rust on bluegrass apply chemicals as __________in early stages of disease.

4. The control of mushrooms is to ____________________and destroy them.

5 The symptoms of fading out are______________________________dead areas from a few inches to several feet in diameter.

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Topic Test
on
IDENTIFYING PLANT INSECTS AND METHODS OF CONTROL

Student: ____________________ School: ____________________

Date: ____________________ Score: ____________________

PART I: Fill in the blanks:

1. __________ of plants are damaged by grubs.
2. __________ rolls into a ball when disturbed.
3. __________ are miscroscopic worms that attack roots and cause galls.
4. Leaf Rollers are small __________ that wrap leaves around themselves for shelter and food.
5. Aphids are sometimes called __________.
6. __________ are small, attached insects covered with shells or armor that suck sap from the plant.

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Assistant Groundskeeper 944-XIII-10

Topic Test
on
NEMATODES

Student: ______________________ School: ______________________

Date: ______________________ Score: ______________________

Fill in the blanks:

1. The ______________ nematode is the most common type in Texas.

2. Tomatos and ________ are very good hosts for nematodes.

3. Before spending a large amount of money for chemicals, determine if nematodes are causing a significant amount of damage to justify the __________ and __________.

4. ______________ and nitrogen nodules are often confused with knots caused by nematodes.

5. Nematode-affected plants have less ability to withstand lack of ______________, lack of water or any adverse condition.

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Topic Test
on
CONTROL OF MOLES, GOPHERS, BIRDS, AND DEER

Student: ____________________ School: ____________________

Date: ____________________ Score: ____________________

Fill in the blanks:

1. Conical mounds of dirt pushed up from their main run indicates the presence of a __________.

2. ______________ and ______________ are the most effective means of destroying moles.

3. A bird that has no friends and should be eliminated is the ___________.

4. ______________ is the best long term control for deer.

5. Moles are unlike gophers because they have ______________ tunnels.

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Topic Test
on
CONTROLLING WEEDS

Student:_______________ School:_______________

Date:_______________ Score:_______________

Fill in the blanks:

1. _______________should be worn while mixing and applying chemical solution.

2. The_________has been the gardener's most useful tool for over 4,000 years.

3. Peat moss and other organic mulchs are applied to soil in weed control to cut off _______________.

4. In areas where regrowth of persistent perennial weeds require frequent hoeing, use a recommended _______________weed killer.

5. _______________should be applied to the soil several days before trying to pull up weeds.

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Topic Test
on
PRINCIPLES USED TO PREVENT PERSONAL INJURY

Student: ______________________ School: ______________________

Date: ______________________ Score: ______________________

Fill in the blanks:

1. The ___________ should do the lifting when a person attempts to pick up a heavy object without using equipment.
2. One pulley only __________ direction of force.
3. A 1/2" pipe hooked onto a hose makes an effective device for __________ post holes.
4. A wall rack for lumber and pipe keeps the materials completely off the ground and away from _____________ and __________.
5. When you build bold rock walls and rock gardens, a __________ system suspended from a tripod is very helpful.

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Assistant Groundskeeper 944-IX-2

Topic Test
on
SELECTION AND MAINTENANCE OF HORTICULTURAL HAND TOOLS

Student: ______________________________ School: ______________________________

Date: ________________________________ Score: _____________________________

Fill in the blanks:

1. A ____________ shovel is handy for moving sawdust, manure, and other light materials.

2. The scuffle hoe works best on packed, __________ ground.

3. The two most common shapes of lawn rakes are ________________ and ________________.

4. The most common hoes have a _____ inch blade.

5. The ________ _____ rake is a good tool for leveling soil or gravel and collecting earth clods.

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Topic Test
on
MAINTAINING SMALL POWER EQUIPMENT

Student: ______________________ School: ______________________

Date: ______________________ Score: ______________________

Fill in the blanks:

1. ____________ and __________ should be checked when inspecting a belt.

2. Regularly used equipment should always be checked by the __________.

3. Cover cutting surfaces with used __________ or ______ if a machine is to sit out in the weather for a long period of time.

4. __________ or other solvents may be used to clean an air filter.

5. ______________ maintenance consists of periodic equipment inspection and upkeep.

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Assistant Groundskeeper 944-IX-4

Topic Test
on

OPERATING AND MAINTAINING LAWN MOWERS SAFELY AND EFFECTIVELY

Student: ______________________ School: ______________________

Date: ______________________ Score: ______________________

1. The three main categories of power mowers are:

    a. ______________________

    b. ______________________

    c. ______________________

2. What is the general term used to describe the practice of mowing a lawn too close?

3. A sickle bar mower consist primarily of what two parts?

4. What part of plant produces food?

5. How can long clippings damage a lawn?

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Topic Test
on
OPERATING ROTARY TILLERS SAFELY AND EFFECTIVELY

Student: ______________________________ School: ______________________________

Date: ______________________________ Score: ______________________________

Fill in the blanks:

1. The part of a tiller that turns and actually does the digging is called the __________.

2. Normally, front tine tillers do not have __________ wheels.

3. If the front tine tiller must be held back to do a proper job of tilling, the __________________ should be lowered to cause the tines to dig deeper.

4. ____________________ rotary tillers are designed for medium to heavy duty work and can thoroughly mix organic matter into the soil.

5. Before starting any tiller, check to see that all clutches, or belt tension pulleys are __________________.

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Assistant Groundskeeper 944-IX-6

Topic Test
on
OPERATING GARDEN TRACTORS SAFELY AND EFFECTIVELY

Student: ______________________________ School: ______________________________

Date: ______________________________ Score: ______________________________

Fill in the blanks:

1. The usual horsepower range for garden tractors is ____ to ____ H.P.
2. The two most popular garden tractor transmissions are the ____________ type and the ________________ type.
3. Extra pulleys may be mounted on either the gearbox shaft or the __________ to permit use of implements requiring power.
4. Walking type tractors have had moderate improvements such as __________ ________.

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Assistant Groundskeeper 944-X-1

Topic Test
on
INTRODUCTION TO HOME LANDSCAPING

Student: ______________________ School: ____________________

Date: ______________________ Score: ____________________

Fill in the blanks:

1. Gardens can no longer be entirely naturalistic because they do not fit into our ____________ way of living.

2. A good landscape development results only where plants and architectural materials are ____________.

3. When landscape plans are obtained from a nursery without charge, they may be of little value or you may pay for them indirectly through the purchase of __________.

4. The word ________ refers to the entire property.

5. The main problems of designing or arranging elements on the land lie in properly organizing and using the available ____________.

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Topic Test
on
SELECTING A SITE

Student: ____________________ School: ____________________

Date: ____________________ Score: ____________________

Fill in the blanks:

1. The __________ __________ of the homesite should be your first consideration.
2. Proper __________ will prevent intrusion of industry in residential sections.
3. If streets and sidewalks have not been paved or do not exist, part of the future cost will no doubt be borne by the __________.
4. __________ lots are often thought preferable but they make privacy difficult.
5. A lot that is slightly above street level provides __________ and offers a good setting.

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Assistant Groundskeeper 944-X-3

Topic Test
on
SCHEDULING LANDSCAPE DEVELOPMENT AND BEGINNING PLANS

Student: ________________________ School: ________________________

Date: ________________________ Score: ________________________

Fill in the blanks:

1. __________ and __________ are the most essential elements and you should construct them first.

2. __________ are important especially in Texas areas where shade is desirable.

3. Hedges, screens, walls, and fences provide ______________ and assist in ____________________ control around the home.

4. Few gardens can be planned, constructed, and planted in one year without considerable ______________.

5. __________ is the term used for a piece of real estate which may be merely a lot or one with a home on it.

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Assistant Groundskeeper 944-X-4

Topic Test
on
ANALYZING PROBLEMS AND DETERMINING NEEDS

Student: ______________________ School: ______________________

Date: ______________________ Score: ______________________

Fill in the blanks:

1. ____________ is largely a question of individual taste and past environment.

2. The basic step in the preparation of a program is to decide and analyze specific problems of a chosen __________.

3. The four basic considerations that should be included in successful landscape development are:

   a. ____________________

   b. ____________________

   c. ____________________

   d. ____________________

4. From an artistic standpoint, everything varies in __________, __________, and __________.

5. Good landscape development always results in an increase of ____________________ values.

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Assistant Groundskeeper 944-X-5

Topic Test
on
DEVELOPING THE LANDSCAPE PLAN

Student: ____________________ School: ____________________

Date: ____________________ Score: ____________________

List:

1. Four main functions which homesites and farmsites must provide:

   a. ____.

   b. ____.

   c. ____.

   d. ____.

2. Six areas of Texas in which plants vary:

   a. ____________________

   b. ____________________

   c. ____________________

   d. ____________________

   e. ____________________

   f. ____________________

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Assistant Groundskeeper 944-X-6

Topic Test
on
SELECTING PLANTS

Student: _______________________ **School:** _______________________

Date: _______________________ **Score:** _______________________

Fill in the blanks:

1. _______________ and _______________ flowering plants are not as permanent as woody plant materials and usually do not provide as good covering for garden areas.

2. Most native plants require little _______________ or other care when they have become established after transplanting.

3. Plants from the Mediterranean regions and _______________ often have similar cultural and moisture requirements to our native plants.

4. Large shrubs or small trees are _____ to _____ feet tall when full grown.

5. _______________ shrubs attain a height of 6 to 8 feet at maturity.

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Assistant Groundskeeper 944-X-7

Topic Test
on
GRADING, DRAINAGE, AND LANDSCAPE STRUCTURES

Student: ______________________ School: ______________________

Date: ______________________ Score: ______________________

True or False:

__________ 1. The minimum width for an entrance sidewalk is eight feet.

__________ 2. Walks should always be as direct as possible.

__________ 3. Landscape planners with a minimum of design experience should avoid curved walks.

__________ 4. The use of splash blocks is the most desirable method of preventing downspouts from eroding soil.

__________ 5. Lowering the grade around existing trees does not disturb their normal functioning nearly so much as does filling.

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Topic Test
on
WINTER PROTECTION STRUCTURES

Student: ______________________________ School: ______________________________

Date: ______________________________ Score: ______________________________

Fill in the blanks:

1. ________________ gardens often have definite thermal belts and artic regions.

2. The most dangerous spots for frost damage are stretches of open ground exposed on all sides, particularly to the ____________ sky.

3. Regardless of what kind of shelter you use, keep soil ______________________ around plants.

4. ______________ soil holds and releases more heat than __________ soil.

5. ___________ , made of double strength glass and available in several sizes, are set side-by-side to protect large areas.

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Assistant Groundskeeper 944-X-9

Topic Test
on
STRUCTURES FOR SUMMER HEAT PROTECTION

Student: ____________________ School: ____________________

Date: ____________________ Score: ____________________

Fill in the blank:

1. A lath sunscreen should be placed so the laths run in a __________ and __________ direction.
2. If you like to grow __________ loving flowers such as tuberous begonias and cyclamens, you may want a permanent display structure.
3. From sunrise to _____ o'clock in the morning there is very little heat accumulation.
4. The subject of __________ in the garden is frequently ignored or misunderstood--particularly by the beginner.
5. A structure facing an _____ direction is ideal, especially if you live in a hot summer area.